INTERNATIONAL ABSTRACT OF SURGERY

VOLUME 71 AUGUST, 1940 NUMBER 2

COLLECTIVE REVIEW

THE PRESENT STATUS OF SINUS SURGERY

NOAH D. FABRICANT, M.D., Chicago, Illinois

A DISCERNIBLE drift toward conservatism in the surgical treatment of accessory sinus disease is reflected in the literature for 1937, 1938, and 1939. Very little that is new has been added to the operative technique, and there are fewer variations of the generally accepted techniques, for operations on the sinuses are assuming conventional and oft-repeated patterns. Interest in allergy and chemotherapy, with their attendant satisfactory results as well as the illuminating disappointments of the latter, is great, it is true, but chemotherapy is by no means a substitute for well indicated, sanely directed, and intelligently executed surgery.

Literary confessions by doctors have been the vogue for some time. It is, therefore, not surprising that rhinologists are now striving to combat existing prejudices against surgical treatment of the sinuses by admitting that part of the blame is theirs, for one frequently hears the statements—made not only by the general public but by general practitioners as well—"Once a sinus, always a sinus," and "One operation will always lead to another."

Not all of the existing difficulties, however, can be traced to the doorstep of the rhinologist. There are many men in our country, practicing rhinology with all varieties of surgical expertness and inexpertness, whose training can offer little or no justification for their attempting to perform major sinus surgery. In a large measure their failures are responsible for the disturbed state into which the rhinological specialty has fallen and for the ensuing skepticism concerning the ability of all rhinologists to operate and obtain good results. Perhaps as a result of the frank and open discussion now going on in the medical literature one may anticipate a clearer understanding of the indications, contraindications, and limitations of various sinus operative procedures.

Definitions. A distinction between conservative and radical surgery is made by Coates. He classifies as conservative those operative procedures employed for the correction of septal deviations, removal of polypoid hyperplasias and polyps, removal of portions of the middle turbinate that cause obstruction to ventilation and drainage, the opening of individual ethmoid cells, enlargement of the ostia of the frontal or sphenoid sinuses, and the establishment of window openings into the maxillary sinus via the inferior meatus. He classifies as radical operations those having an external approach by means of which the entire lining mucosa of such sinuses as the frontal, ethmoid, sphenoid, or maxillary is removed with the object of eliminating all diseased tissue. Intranasal procedures which accomplish the same purpose are also considered to be radical, for example, a complete intranasal ethmoidectomy. McLaurin would substitute the word "complete" for "radical" to indicate the thorough removal of all diseased tissue, and states that if sinusitis does not respond to conservative measures a complete operation is indicated.

In deciding upon conservative or radical procedures upon the nose or sinuses one must have a comprehensive understanding of the individual cases, and a thorough knowledge of the under-

From the Department of Rhinology, Laryngology and Otology, University of Illinois College of Medicine.

lying pathological processes is necessary before resorting to surgical intervention. The diagnosis should be accurately established on the basis of the clinical history and course, the roentgenogram, and other laboratory findings, particularly the bacteriological and cytological study of the nasal and sinus secretions. In the final analysis and evaluation of the indications for surgical procedures in sinus cases, Hansel maintains that the possibility of the allergic factor always exists and the question of primary importance is whether the pathological conditions in the nose and paranasal sinuses are the result of a pure allergic process, a primary infection, or a combined allergic and infectious condition. In general, the results obtained from surgical procedures on the nose and paranasal sinuses in allergy have been unsatisfactory, although surgical removal of polypoid tissue may often be necessary.

When results were good they frequently were of a temporary nature and could be explained on the basis of trauma and non-specific reaction. Porter claims that rhinologists when thorough in their surgery and in their after-treatment can do more for certain patients than the allergists can. Allergy is undoubtedly important, but at best it appears to Beeson to be a highly speculative subject, grossly overrated, overemphasized, and underdiagnosed. For no matter how enthusiastic one may be about allergy, patients still become ill from other causes.

Mithoefer believes that a rapid surgical approach in chronic cases is often a great mistake. When surgery is necessary, its success will depend on the ability of the surgeon to detect every affected sinus, and his accuracy in removing all of the diseased mucous membrane. In the extreme winter months Tivnen advocates the postponement of surgical procedures of a radical type, especially if epidemics of the upper respiratory tract are present. Montgomery declares the following to be the reason for the failure of sinus surgery: inadequate elimination of all etiological factors, allergy superimposed upon infection, too much or too little operation, and failure to stress diet, endocrine factors, and intestinal stasis.

Maxillary sinus. The accessibility of the natural ostium of the maxillary sinus has been a controversial issue for many years. Although irrigation of the maxillary sinus through the ostium is by no means new, increasing attention has been directed more recently to this form of treatment of maxillary sinusitis. In an exhaustive anatomical study of the surgical accessibility of the maxillary ostium Van Alyea demonstrated that the ostium or accessory opening was easily accessible in 54.5 per cent of his 163 anatomical specimens, in 32 per cent it could be entered with difficulty, and in the remaining 13.5 per cent it was entirely inaccessible. Rosenberger and Merica reviewed their experiences with natural or accessory ostium irrigations and found them preferable to inferior or meatal opening irrigations. Only when they failed to locate this orifice readily did they resort to puncture below the inferior turbinate.

Futch attributed the advantages of ostium irrigation in suitably selected cases to the diminished danger from embolism, the absence of hemorrhage, the improbable occurrence of emphysema, and the fact that it is a procedure which is feared less by the patient than puncture through the naso-antral wall and one in which nervous patients would experience little shock. Certain conditions, however, contraindicate the use of this technique. These are: a hypertrophied middle turbinate, a deviated septum filling the middle meatus, a high uncinate process, an overhanging bulla ethmoidalis, an exceptionally deep infundibulum, a natural ostium less than 1.5 mm. in diameter, a middle meatus filled with polyps, contracture of the ostia due to previous inflammatory attacks, and closure of the ostia due to irritation by repeated canalizations.

The maxillary sinus has been regarded as a greater contributor to secondary disease than any of the other sinuses. Ebbs examined at autopsy the sinuses of 496 children below the age of fourteen. These children died from a great variety of causes. A purulent infection involving one or more sinuses was revealed in 30.6 per cent of the cases. Most of the infections were in the antrum. In children under two years of age the incidence was higher than in those over two years of age. Von Bajkay analyzed the cases of sinusitis seen in the Budapest Rhinolaryngological Clinic during a ten-year period. Of a total of 56,242 patients 13,490 were subjected to various operative procedures. Of those with acute maxillary infection 80 per cent had conservative treatment. In a series of 1,279 antrum punctures only 4 had complications. In general, the operative results compared favorably with those of other large clinics.

In a symposium on the final results of operations for chronic suppurative paranasal sinusitis in which the merits and demerits of both the intranasal operation and the external operation were discussed, Hempstead asserts that the surgical treatment of chronic maxillary sinusitis cannot follow rigid and circumscribed rules, for treatment here—as elsewhere—must be suited to the individual patient. Although there are patients

for whom only a radical Caldwell-Luc operation will suffice, he finds that most often conservative measures will restore the maxillary antrum to a normal state. Such a procedure as the intranasal window operation is easily and quickly accomplished with the patient under a local anesthesia. Reaction to it is much less severe than that following the radical Caldwell-Luc operation. Hempstead reports 1,634 cases gathered from the medical literature. A good result was obtained in 97 per cent of these cases by the intranasal window operation. The high percentage of good results obtained with this operation, he believes, justifies its use in the treatment of selected patients having chronic maxillary sinusitis.

In this symposium Salinger displays no hesitancy in stating that the Caldwell-Luc operation is the most satisfactory surgical procedure about the nasal accessory sinuses and the one which should yield the highest percentage of good results because the technique is simple to carry out, the entire sinus is open to inspection, complications and sequelæ are rare, and the nasal function is in no way impaired. However, he never advises a Caldwell-Luc operation unless he is satisfied that there exists within the antrum a degree of pathological change which is beyond the hope of repair by any means short of complete removal and that the pathological change so diagnosed is the cause of the symptoms for which the patient is seeking relief.

Between these two positions, each supported by individual adherents, lies a point of view and surgical attack which is summarized by von Bajkay. He performs an intranasal window operation in cases of chronic sinusitis which do not adequately respond to frequent irrigations by puncture over a period of from four to five weeks. If this procedure proves unsatisfactory he later does a radical Caldwell-Luc operation. Muskat, pursuing the teachings of Ferris Smith, employs antrum lavage alone or together with antrum-window resection. When such conservative measures are inadequate the removal of the entire antral mucosa by the radical procedure is indicated. Moreaux reports cures in 31 of 38 patients operated on by the conservative intranasal route. Because of persisting symptoms the remaining 7 were subjected to a radical operation. In general, Moreaux proceeds with radical surgery when sinus polyposis occurs, when the infection is of dental origin, or when the thickness of bone prevents puncture. Millar, too, favors a radical operation, in which the mucosa is entirely removed, in those cases in which the sinusitis does not respond to lavage.

Unusual complications following radical operations on the antrum were described by Grove and Fuller. In Grove's case paralysis of the external rectus and inferior oblique muscles of the eye followed a radical-antrum operation in which the operator attempted to enter the ethmoid labyrinth transantrally. The ocular symptoms disappeared only in part, and two and one-half years later the patient still had diplopia. In Fuller's case the immediate postoperative course was uneventful, but one year later there was complete atrophy of all the soft tissues of the face on the side of operation.

The tendency among various groups in the medical profession to disapprove all forms of intranasal operation on the sinuses is not warranted, according to Faulkner, although some reason for this point of view lies in the bad results observed from imperfect and incomplete operations. Faulkner does not by any means consider the external route the only one, even though many patients can be properly treated only by this method, and deplores the tendency to advocate the external route as the only one which should be used in operations in this field.

Ethmoid, frontal, and sphenoidal sinuses. The ethmoid operation is performed either intranasally or externally. When one considers the central anatomical position and the sponge-like structure of the ethmoid cells, one can readily understand why most rhinologists consider this a most important area of the sinuses and one most difficult to treat. Brown advocates the radical operative treatment of chronic infections of the posterior group of the upper nasal accessory sinuses, namely, the ethmoidal and sphenoidal sinuses. He believes that satisfactory exenteration of these cells in chronic diseased states can be brought about by appropriate operations, and that in nearly all instances patients can obtain great, if not always complete, relief from their symptoms. He employs two methods of approach for treating radically the cells in question, and the choice between them depends upon whether the frontal sinus is grossly involved and needs radical treatment or not. When the frontal sinus, as well as the posterior cells, requires radical treatment, his rule is to operate by the paranasal route; when the frontal sinus does not require radical treatment the approach to the ethmoidal and sphenoidal cells may be made through the maxillary sinus.

The fronto-ethmoidal operation is one of the most difficult and also one of the most debated questions in rhinology. At the present time, apparently, the majority of rhinologists favor the

conservative external operation, the principles of which were laid down by Howarth: "The chief object is to drain the sinus whilst preserving its mucous membrane as far as possible," and "to regard the ethmoid as the key to the frontal sinus."

Matis states that the fundamental features of the modern conservative external operation include a small incision in the mesial wall of the orbit, the removal of the sinus floor, radical ethmoidectomy, and the establishment of good communication between the frontal sinus and the nasal cavity. To operate according to the modern principles mentioned above, he employs the subperiosteal method, the principles of which are based on the subperiosteal approach under the soft tissue, similar to the submucous approach by septum-resection.

The majority of intranasal operations should be followed by rapid recovery without any complications if the usual precautions, operative and postoperative, are observed. In surveying the complications of intranasal surgery, Davis calls attention to the following injuries to the neighboring structures which have occurred in spite of a careful technique: perforations and injuries to the roof of the nose or cribriform plate, injuries to the orbit and its contents, injury to the optic nerve, and injury to the nasolacrimal duct.

The persistence of pain—ever a disconcerting problem to the rhinologist—following radical operation upon the paranasal sinuses has been the subject of an investigation by Skillern. A tabulation compiled from reports by 16 rhinologists lists the following causes for the persistence of pain, in the order of frequency: incomplete operation, disease elsewhere than in the sinus operated on, systemic disease causing symptoms of sinusitis, synechiæ or scar tissue blocking drainage or enmeshing the nerve, painful contractures, injury to a nerve, operation on the ethmoids and turbinates for insufficient reason, individual (nervous) reaction to pain, neuritis of the fifth cranial nerve, and atypical neuralgia of unknown origin. Further, Skillern believes that the persistence of pain following radical operation on the frontal sinus may be due to: failure to remove every vestige of infected material; localized meningitis or osteomyelitis; re-infection from overlying sinuses; and infection of adjacent ethmoid cells. In the ethmoid capsule and sphenoid sinus the persistence of pain is due to traumatized periosteum or bone near the foramen, direct injuries to the nerves or blood vessels, the proximity of the meninges, and to localized meningitis or osteomyelitis.

Sinusitis in children. Recently, sinus disease in children—a subject that has been surveyed inadequately by rhinologists, pediatricians, and general practitioners for many years—has begun to attract thoughtful consideration. Since children are particularly prone to recurring attacks of upper respiratory infections, it can be readily surmised that extension of a nasal infection to the sinuses often takes place. However, it is only relatively recently that cognizance has been taken of the fact that persistent purulent nasal discharge may be something more than a "cold". In outlining his experience with sinusitis in children during a period of some twenty years, Mitchell states that allergy predisposes the sinuses to infection because of the stasis and blockage it produces. He finds that chronic maxillary sinusitis may require a naso-antral window operation. Many of the patients, treated in collaboration with Shea, were subjected to this procedure, as well as to a series of autogenous vaccines given after the operation.

Reliance on roentgenograms, diagnostic puncture of the antrum, and bacteriological study of the secretions for the diagnosis of sinus disease are part of a well balanced approach now employed by Looper, Crooks, Bowen-Davies, and Strachan. It is possible to employ a local anesthetic when irrigation of the antra of children who are more than six years of age is performed. Should the child prove uncoöperative, Lindsay advises making a window into the antrum. Occasionally the middle turbinate is amputated to improve drainage. When pus is present in the antrum, Bettington performs a naso-antral window operation, using a punch forceps rather than a rasp. The usual objections to radical operation on the antra of children are invalid, McArthur finds, if the opening is made sufficiently high and damage to the infra-orbital nerve is avoided.

In a study of the relation of upper respiratory-tract infection to early bronchiectasis in children, Ebbs analyzed the results of post-mortem examinations on 200 children dying of pneumonia and found that infected sinuses occurred in 42.5 per cent. He stressed the importance of early diagnosis of bronchiectasis and the removal of coincident disease in the sinuses.

Lacy and Engel maintain that acute osteomyelitis of the superior maxilla in children requires early operative intervention. Drainage should be established primarily through the mouth and secondarily through the antrum. Maxillary sinusitis is a complication of the osteomyelitis rather than a cause of it. In their opinion the prognosis is not bad when there is early sur-

gical intervention. In a symposium on orbital cellulitis Davis and Mygind assert that this condition for the most part was found to be due to sinus infection. The frontal sinus was the most frequent offender in adults, and the ethmoid sinus in children.

Malignant tumors. That malignant disease of the paranasal sinuses can be cured if proper and thorough treatment is employed is asserted by New. He uses various types of cauterization, surgical diathermy, and radium and roentgen rays. He completely eradicates the tumor at one time, regardless of the resultant deformity. Loss of an eye or perforation of the cheek must be considered of secondary importance. Plastic surgery can correct deformities to a great extent if the tumors do not recur. The selection of patients for operation is based on the location and extent of the growth, the type of tumor, the presence or absence of metastasis, and the patient's age, general condition, and ability to return for further observation. Recurrent adenocarcinomas and tumors of a low grade of malignancy are susceptible to treatment because they are less likely to metastasize than other more highly malignant growths.

New reports the results in 295 cases of malignant tumor of the upper jaw and antrum in which operation was performed previous to 1929. Two hundred and thirty-six patients were traced, and 53.8 per cent were found to be living without recurrence five years later. Of those who apparently had primary tumors of the antrum, 40 per cent were living without recurrence five years later; of those with secondary antral tumors, 53.4 per cent were living without recurrence five years later; and of those with tumors of the upper jaw and palate, 62.7 per cent were alive without recurrence five years later.

A malignant neoplasm of a nasal sinus is seldom, if ever, confined within a mathematically calculable area, according to Lederer. The development of sinus cancer is slow and metastasis is infrequent. While the symptoms usually vary, in the main those to be noticed are unilateral nasal obstruction, mucopurulent or serosanguineous discharge, ocular and olfactory disturbances, and external deformity. Surgery or electrosurgery combined with irradiation have given fair results in malignant tumors of the paranasal sinuses, especially those of the antrum. Malignant tumors of the frontal sinuses should be exposed widely through the external route. Cosmetic results should not enter into consideration. As much of the mass is removed as is possible and the remainder is coagulated by surgical diathermy. The frontal lobe is fully exposed when the dura is invaded. Radium may be used here, since the dura is quite resistant.

Osteomyelitis. Four important surgical principles which should be observed in handling osteomyelitis are mentioned by Adson and Hempstead. These are: adequate drainage of the frontal sinus; removal of pus, necrotic bone, and all adjacent white dead bone; preservation of the periosteum; and hair-line incision. Their technique calls for obliteration of the frontal sinus by removal of its inner plate. The cavity is filled with gauze saturated in iodine, and this is removed on the third day.

Behrens describes two types of osteomyelitis: the localized, which results from a small perforation due to pressure of pus in a frontal sinus; and the rapidly spreading, which results from sudden change in activity of the localized type. Mortality in these cases ranges from 35 to 79 per cent. The cases developing postoperatively are more serious than the spontaneous type. Conservative treatment decreases the mortality. The treatment ranges from radical to conservative. The radical calls for thorough and wide removal of all diseased bone, draining of all abscesses, and grooving through healthy bone an inch beyond the disease. The conservative calls for removal of sequestra, as they are found, with the addition of transfusion and supportive treatment.

Hirst reports 2 cases of osteomyelitis of the skull complicating mastoiditis and frontal sinusitis. In analyzing the records of published cases, he finds that this tragic sequel to mastoiditis or frontal sinusitis has occurred in cases in which there was no surgical intervention, and in others in which it was thought that there was too little or too much surgical intervention. In general, he believes that once diagnosis has been established, radical operation with wide resection of bone should be done for a cure.

Finally, Porter declares, "In osteomyelitis resulting from an infection of the frontal sinus, I follow the method advocated by Dr. Mosher and remove the entire bone in one section, endeavoring to include the whole of the sinus and sufficient bone to give a wide margin beyond the area of evident infection. It is a great temptation to be less radical in the hope that we are dealing with a simple bone necrosis, only to find later that we have lost the best opportunity to get ahead of the disease. At the Massachusetts Eye and Ear Infirmary we have demonstrated that to wait for x-ray evidence of extension is frequently disastrous, as the disease is from one to two weeks ahead of the x-ray."

BIBLIOGRAPHY

1. Adson, A. W., and Hempstead, B. E. Arch. Otolaryngol., 1937, 25: 363.
2. Alden, A. M. South. M. J., 1938, 31: 282.
3. Bajkay, T. V. von. Monatsschr. f. Ohrenh., 1938, 72: 56.
4. Idem. Hals-, Nasen-u. Ohrenarzt, 1938, 47: 1.
5. Beeson, H. B. Wisconsin M.J., 1939, 38: 474.
6. Behrens, H. C. Arch. Otolaryngol., 1937: 25: 272.
7. Bettington, R. H. Med. J. Australia, 1938; 1: 853.
8. Bowen-Davies, A. Proc. Roy. Soc. Med., Lond., 1938, 31: 1411.
9. Brown, R. G. Australian & New Zealand J. Surg., 1939, p.179.
10. Coates, G. M., and Gordon, W. Med. Clin. North Am., 1938, 22: 1565.
11. Crooks, J. Brit. M. J., 1938, 1: 935.
12. Cunning, D. S. Laryngoscope, 1938, 48: 429.
13. Davis, E. D. D. Proc. Roy. Soc. Med., Lond., 1937, 30: 1397.
14. Ebbs, J. H. Brit. M. J., 1938, 1: 385.
15. Idem. J. Laryngol. & Otol., 1937, 52: 849.
16. Faulkner, E. R. Arch. Otolaryngol., 1939, 30: 716.
17. Ford, H. L. Illinois M. J., 1937, 72: 540.
18. Fuller, T. E. South. M. J., 1938, 31: 1094.
19. Futch, C. E. California & West. Med., 1938, 48: 438.
20. Grove, R. C. Arch. Otolaryngol., 1938, 27: 275.
21. Hansel, F. K. Ann. Otol., Rhinol., & Laryngol., 1939, 48: 54.
22. Hempstead, B. E. Arch. Otolaryngol., 1939, 30: 711.
23. Hirst, O. C. Arch. Otolaryngol., 1939, 29: 24.
24. Lacy, E. N., and Engel, L. P. Arch. Otolaryngol., 1939, 29: 417.
25. Lederer, F. L. Wisconsin M. J., 1937, 36: 263.
26. Lillie, H. I. Med. Clin. North Am., 1938, 22: 1565.
27. Lindsay, J. R. Illinois M. J., 1937, 71: 323.
28. Looper, E. A. Med. Clin. North Am., 1937, 21: 1323.
29. Matis, I. E. J. Laryngol. & Otol., 1939, 54: 649.
30. McArthur, G. A. D. Med. Journal Australia, 1937, 2: 470.
31. McLaurin, J. G. South. M. J., 1937, 30: 633.
32. Merica, F. W. Ann. Otol., Rhinol., & Laryngol., 1938, 47: 1011.
33. Millar, T. G. Med. J. Australia, 1938, 25: 689.
34. Mitchell, E. C. J. Am. M. Ass., 1939, 112: 207.
35. Mithoefer, W. Ann. Otol., Rhinol., & Laryngol., 1939, 48: 158.
36. Montgomery, D. C. Mississippi Doctor, 1937, 15: 52.
37. Moreaux, R. Oto-rhino-laryngol. internat. 1938, 22: 203.
38. Muskat, I. Illinois M. J., 1939, 75: 153.
39. Mygind, S. H. Proc. Roy. Soc. Med., Lond., 1937, 30: 1397.
40. New, G. B. Am. J. Surg., 1938, 42: 170.
41. Payne, V. L. Mississippi Doctor, 1938, 15: 58.
42. Porter, C. T. Ann. Otol., Rhinol., & Laryngol., 1939, 48: 769.
43. Rentschler, H. D. Eye, Ear, Nose & Throat Month., 1938, 17: 390.
44. Rosenberger, H. C. Ann. Otol., Rhinol., & Laryngol., 1938, 47: 176.
45. Salinger, S. Arch. Otolaryngol., 1939, 30: 721.
46. Shea, J. J. J. Am. M. Ass. 1939, 113: 909.
47. Simpson, W. L. Arch. Otolaryngol., 1937, 26: 270.
48. Skillern, S. R., Jr. Pennsylvania M. J., 1938, 41: 1017.
49. Slack, H. R. South. M. J., 1937, 30: 222.
50. Strachan, J. G. Bull. Acad. Med., Toronto, 1938; 12: 11.
51. Tivnen, R. J. Surg. Clin. North Am., 1937, 17: 393.
52. Van Alyea, O. E. Arch. Otolaryngol., 1936, 24: 553.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Schuerch, O.: Reconstructive Surgery after Treatment of Cancer of the Face (Ueber wiederherstellende Operationen nach Behandlung boesartiger Geschwuelste des Gesichtes). *Plastica chir.*, 1939, 1: 60.

The author emphasizes the importance of radical surgery in the treatment of malignant tumors of the face without regard for the resulting plastic problem. He reports from the Zurich University Clinic the method used in handling these tumors. He prefers electrosurgery to the knife because of the danger of implanting metastases, and advocates a considerable time interval before repair, especially in cases of deeply infiltrating tumors. He points out the importance of securing as favorable a bed for repair as possible by the excision of damaged tissue in the area and by careful hemostasis.

Small carcinomas of the face and eyelids, both basal and squamous-cell, are treated primarily by a large single dose of x-ray, but radium has also been used in their treatment. Larger and invasive tumors are treated by the fractionated method of Coutard. Only rare recurrences have been observed and the cosmetic results are good. Electrosurgery is used only if adequate radiation fails to destroy the tumor or if there are recurrences. Plastic repair is necessary only in cases in which the amount of tissue removed is large.

Basal-cell carcinoma on a senile hyperkeratosis requires bold surgery. New tumors will appear about areas of radiation, and if this happens even a destructive dose is useless. Excision of all the damaged skin and repair must be done.

Recurrent carcinoma on an area damaged by previous radiation raises the question whether the initial dose was adequate. Re-radiation is unwise, particularly if done soon after the initial radiation, because of the danger of radiation necrosis. It is better therefore to make a wide excision including all the damaged skin and then make a repair.

The tumor arising on a lupus-vulgaris base is usually squamous-cell carcinoma. It appears most often on scarred radiated areas and is very malignant. It seems wise to excise widely areas of long-treated lupus in which there are small ulcerations which will not heal. When carcinoma is present it is best to make an even wider excision. Both will need repair. The character of this carcinoma makes it unsuitable for x-ray therapy.

Nevi and malignant melanoma do not respond to x-ray therapy. Electrosurgical excision is preferred if no metastasis is present, with subsequent repair if there are no recurrences or metastasis.

Lip carcinoma is treated with x-ray or surface radium with good cosmetic results. Operation is seldom necessary for recurrence or plastic repair. X-ray is useless if the jaw bone is involved and the question is whether to destroy the tumor and the underlying jaw with electrosurgery. Gland metastasis appears so soon and the outlook is so uncertain that the patient seldom appears for repair. If it is done a single-pedicled or double-pedicled temporal flap is most favorable.

Carcinoma of the membrane of the cheek is best treated by electrosurgery. If limited to the membrane the tumor is excised with preservation of the overlying skin. The skin is protected from the heat by ice or a spray of ethyl chloride. If the tumor infiltrates the skin, the cheek is destroyed, preferably with the full thickness between two active poles. The repair is done with a single-pedicled or double-pedicled temporal flap.

The author presents histories and photographs of 9 illustrative cases, showing the initial lesions and the final repairs. BRADFORD CANNON, M.D.

Robin, I. G.: Malignant Disease of the Maxilla. *Guy's Hosp. Rep.*, Lond., 1939, 89: 301.

Most growths of the maxillary region arise from the walls of the antrum. They originate from the epithelial cells, more commonly in the mucosa, but occasionally from dental tissue. Although the normal antral lining membrane is ciliated columnar in type, there is great variation in the type of cells in the tumor. The most common is the squamous cell, which may be more or less differentiated in form. All epitheliomas tend to be slow-growing while confined to the antrum; they metastasize late and recur locally and in more malignant form when incompletely removed. Various forms of sarcoma and endotheliomas also occur.

Infection in the antrum often complicates growth and may play a large part in the symptomatology, for it tends to disguise the malignant nature of the lesion. It may be the first and even the only symptom. It is not a bar to operative treatment or radiotherapy.

The average age of patients with cancer of the antrum is between forty and sixty. Sarcomas appear at any age but, as these are being considered more and more to be atypical or anaplastic carcinomas, the consideration of the age factor cannot be said to be of much value from a diagnostic point of view. There is no significant difference between the number of men and women affected.

Early signs and symptoms of primary growths of the antrum can exist for a long time before symptoms arise that are definite enough to make the patients

report to the surgeon. The following are most commonly seen:

1. Discharge. This is unilateral, usually thin, purulent, and slightly blood-stained. The finding of a blood-stained fluid on antral lavage must always be considered suspicious.

2. Obstruction of one nostril. This is usually a late complaint, but may be early. It is not commonly due to actual invasion by growth into the general nasal cavity, but to surrounding edematous tissues, or to large myxomatous polypi following secondary infection. The sudden appearance of any type of polypi with epistaxis should arouse suspicion, and a careful investigation should be made.

3. Pain. This is not usually a prominent symptom in the early stages. It occurs in the trigeminal area, and most often in the infra-orbital part of the maxillary division, being felt on the face and alveolar margin. It may be intermittent, sharp, stabbing in character, due to nerve irritation, or dull and boring, due to erosion of the bone.

4. Hyperesthesia and anesthesia. These may occur in large or small patches over the cutaneous and membranous areas supplied by the maxillary nerve. They may be early signs. The reaction to pin prick should always be tested on the face and hard palate.

5. Epiphora. Sudden increase in the lacrimal flow may be an important sign. Growths originating in the anterior maxillary ethmoidal region cause this complaint.

6. Expansion of the antral walls. This may occur early or late, but it is a bad sign. Any of the six walls may bulge out, or several may be involved simultaneously. As a rule, the growth erodes the bony wall and invades the neighboring structures. Expansion of the cavity without bone erosion is usually considered diagnostic of a benign tumor.

The diagnosis rests between an inflammatory condition, a benign tumor, and a malignant disease arising in the nose, nasopharynx, and palate.

The consensus of opinion is that the outlook is grave in early cases, and hopeless in late cases. In the former, large doses of irradiation should be given in combination with adequate surgical removal and drainage. It is impossible to be dogmatic about how much this surgical step involves, but it should include palatal fenestration in most instances. Whether irradiation should also be given before the operation depends on the type of growth and its extent. It is likely that pre-operative radiation will in future be given more often and in larger doses. It must also be remembered that many patients with apparently hopeless conditions have survived longer than expected and in much greater comfort, because treatment has not been denied; this entails drainage operations to combat septic absorption, and irradiation to decrease pain.

Improvements in radiotherapy offer the most hope of better results; radical surgery alone cannot cure more than a few cases, and "partial" surgery plays only an assisting, although necessary, part. Even if diagnosis be made much earlier so that small, localized, and "operable" growths are found more often, there is no doubt that the surgeon and the radiotherapeutist must still work together.

SAMUEL KAHN, M.D.

Ganzer, H.: A Contribution to the Technique of Bone Transplantation in Defects of the Mandible (Beitraege zur Technik der Knochen Transplantation bei Unterkieferdefekten). *Plastica chir.*, 1940, 1: 113.

In 96 per cent of 300 cases of bone transplantation for defects of the mandible the results have been successful. In only 4 per cent was the transplant removed, and in these a second operation was successful. These good results are believed to be due to careful asepsis, the provision of normal physiological conditions for the transplant, and the fact that the jaw bones were kept in a healthy state. Atrophy was minimal and the transplant rapidly adapted itself, particularly when so placed that it fulfilled a functional need.

In cases in which there was no loss of substance, but the fractured bones overrode one another and formed a pseudarthrosis, it was necessary only to free the ends of the bone and suture them with catgut or lock them in position. The periosteum was so sutured that it did not overlie the bony junction. Healing occurred rapidly.

The preparation of physiological conditions for the bone, and later the transplant, begins with the care of the initial wound. Dead spaces are packed open and allowed to heal as early as possible. Sometimes one can freshen the edges of the wound and suture primarily, the bone fragments being buried deep in the wound where they are well nourished and will heal spontaneously. The wound is drained either inside of the mouth or outside. This early closure of the wound prevents deeply depressed scars which may extend between the bones and hinder union.

The suturing of the tissues alone is not enough. The bone fragments must be immobilized for proper union, either by wiring of the teeth, if present, or by dental splints. Splinting is difficult if the ramus of the edentulous jaw is pulled forward by the muscles of mastication. The use of an impression splint between the posterior fragment and the maxilla is preferred as scar contracture is prevented and the jaw bone and muscle yield readily. The combination of the splint inside and the sutured wound outside will produce union or if the loss is great will maintain good condition of the bone for future transplantation.

When the general condition of the patient is good, transplantation is done. Asepsis is essential and any accidental opening into the mouth is reason to stop the operation. The jaw is operated upon first. Through a curved incision a skin flap is raised. The subcutaneous tissue is incised at a different level to avoid superimposed suture lines. The bones are exposed and the ends shaped. The transplant is cut

Fig. 1.

Fig. 2.

Fig. 3.

Figs. 1, 2 and 3. Showing the profile after injury and after repair, and the final roentgenogram. Bone transplantation carried out in three stages.

slightly longer than the defect in the jaw so that after shaping it is held locked in place by the spring of the bones. The bone ends are sprung apart with a caliper. Occasionally, drill holes and sutures may be necessary. Great care must be used in handling the transplant, for asepsis and primary healing are more important than any other consideration.

If both horizontal rami are gone and the chin falls back against the larynx, traction on the chin will separate the fragments so that bilateral transplantation can be done and the transplants held locked by the tension between the chin and the angle of the jaw.

When the loss is at the angle of the ascending ramus of the jaw the transplant must be fractured to correspond to the defect. The transplant thereby loses its rigidity, and support of the jaw with a splint is necessary to maintain fixation.

If the ascending ramus is involved but some of it remains, it is better to fix it firmly against the mandibular notch. The proximal fragment is so small that it is easily freed later. This will give a more satisfactory joint than can be formed by an arthroplasty. This method of simple fixation has proved quite successful.

When the ascending ramus and mandibular notch are shattered and lost there is no reason for removing the condyle. The condyle is adducted and protects the bone transplant so that free opening of the mouth is possible. After all, function is more important than an anatomical preparation.

When the joint cavity is empty a piece of iliac crest with periosteum and fascia left on one end is fixed between the socket and the end of the mandible. If the joint is filled with débris the transplant articulates with the mastoid process. If the defect is long, two operations may be necessary.

If the chin is destroyed it is corrected by a single transplant broken in one or two places to produce a curve. If the chin and body or ramus are destroyed it may require two or three operations. The chin is built first and one or two transplantations are done for one or both horizontal rami.

These procedures may seem prolonged but the more the possibility of failure is considered the less one will gamble and a successful result will be obtained. BRADFORD CANNON, M.D.

Rodinò, D.: A Contribution to the Study and the Treatment of Adamantinomas of the Mandible (Contributo allo studio e alla terapia degli adamantinomi della mandibola). *Riv. di chir.*, 1940, 6: 12.

Rodinò recalls the different classifications of epithelial tumors of the mandible and those of the adamantinomas themselves. He discusses the various theories proposed to explain the pathogenetic origin of these tumors and states that the theory of Malassez has found the greatest number of supporters. Malassez claims that adamantinomas originate from paradental epithelial remnants which remain dormant and later, under the influence of some stimulus, give rise to abnormal and atypical proliferation and produce pure malpighian tumors, tumors mixed with adamantine tissue, or pure adamantine tumors, according to the plane of cells from which they originate. Adamantinoma of the mandible is not a clinical rarity. The author describes 2 interesting cases.

The first case occurred in a man, aged seventy-nine years, and the second in a woman, aged thirty-nine years. Adamantinoma is supposed to be more frequent in women and to appear usually between the ages of thirty and fifty years. In both cases, the tumor was localized in the left side of the mandible, which is the site of predilection. The prevalence of adamantinoma in the mandible has been attributed to the greater possibility of infection of this bone. The mandibular angle is especially involved by the

neoplastic process; this was true in the author's 2 patients. Among the factors capable of inducing the appearance of adamantinoma, great importance is attached to trauma, understood in a broad sense to include dentition, dental inclusion, surgical intervention, dental extraction, and eruption of the third molar.

The course of the tumor is usually very long, especially in solid adamantinomas, while the cystic type develops more rapidly. Pain is generally absent, except in some cases in the beginning and before the swelling becomes evident. The general condition of the patient remains unaffected if there is no disturbance of mastication. Usually, there is no metastasis. In spite of their benignity, adamantinomas often recur if not completely removed, and it seems that the recurrence is often malignant. The volume of the tumor varies and may reach the size of a hen's egg, or may become even larger. The macroscopic aspect of the tumor depends on its type, whether cystic or solid; mixed forms are the most frequent ones observed. The tumor slowly destroys the spongy part of the bone and then causes deformation of its internal and external cortex which may be reduced to a thin layer or become eroded. The teeth may be loosened and fall out, fistulas may be formed, and ulcerations may appear which lead to infection and suppuration of the tumor. The structure of adamantinoma is characterized by epithelial formations which form a network in a fibrillary connective tissue, but this aspect may be changed by degenerative processes. The cystic cavities are divided by connective tissue which often contains bone lamellæ; the latter are remnants of the mandibular bone. Zones of enamel and dentin may be present. The tumor contains numerous vessels with only endothelial walls.

There are few symptoms of this tumor; swelling is usually the first sign and the aspect of the tumor depends on its development. The mucosa may ulcerate and show granulation tissue which bleeds easily. Suppuration aggravates the local symptoms; fistula formation may reduce the size of a cystic tumor. Hemorrhage by secondary erosion of an artery is rare. The diagnosis of adamantinoma is difficult, but roentgen and histological examinations reveal the true nature of the tumor. The differential diagnosis includes acute and chronic inflammations of the mandible. The prognosis is good if the tumor is attended to in time; it is aggravated by the presence of complications. The treatment consists of ample surgical excision of the tumor without disturbance of the continuity of the bone. When this is impossible, more or less extensive resection of the mandible has been done, followed by bone transplantation in young subjects and the use of a prosthesis in older individuals.

In the first of the author's cases radium treatment produced healing, which has now continued for one year; he recommends this therapeutic method before resort is made to mutilating surgery.

RICHARD KEMEL, M.D.

EYE

McKinney, J. W.: Corneal Transplantation. *Am. J. Ophth.*, 1940, 23: 371.

Sixteen cases of corneal transplantation are reviewed in detail. The technique of Castroviejo was used in each case. In 6 eyes a visual acuity of 6/60 or better was obtained, in 3 sight was "improved," in 4 it was unimproved, and in 3 it was worse as a result of the operative procedure. It was considered that operation was successful in 80 per cent of the favorable, and 55 per cent of the unfavorable cases.

It is emphasized that if the graft is to remain clear it must be placed in contiguity with a relatively clear cornea, or a leucoma containing corneal elements. Anterior synechiæ constitute an unfavorable prognosis, indicating a severe process with incalculable damage to the intra-ocular structure. Aphakial eyes, likewise, offer a poor outcome because of the presence of vitreous. If glaucoma is present a filtering operation should be performed prior to the transplantation. The presence of cataract requires removal subsequent to the transplantation. In the 16 cases reported the donors were limited to eyes enucleated for ocular neoplasm, no cadaver or fetus eyes having been available. In 2 of the donor eyes glaucoma was present; the postoperative course in these cases seemed identical with that in the cases with non-glaucomatous transplants.

In 6 cases the iris was found to be widely adherent to the cornea at the time of the keratoplasty and a large piece of the iris was removed with the corneal segment. The remaining adherent portion was freed from the cornea with the spatula, withdrawn, and resected. In no case did the iris become adherent subsequently to the graft. In 2 cases mature cataracts were removed through the defect in the cornea, but in neither instance was the graft successful. Transplantation in 1 case of corneal dystrophy, in which the entire cornea participated, was a failure; in another, with a normal epithelium, it proved a success, the graft remaining clear.

Edema of the graft occurs immediately after the keratoplasty, but if the apposition and nutrition is good the transplant becomes as clear as normal cornea in a few days. Nebulas and fine vessels may remain after healing is complete but these may not be incompatible with a fairly clear graft. Glaucoma intervened as a complication in 6 cases and infection in 1 case of trachoma with hypofunction of the lacrimal gland.

The author believes that in favorable cases the number and degree of successful results will increase.

WILLIAM A. MANN, M.D.

NOSE AND SINUSES

Esser, E.: Median Cleft of the Nose (La fissure médiane du nez). *Plastica chir.*, 1939, 1: 40.

The author, writing from Milan, presents 11 cases of median cleft of the nose. She compares the appearance of the deformity to that of the ten-milli-

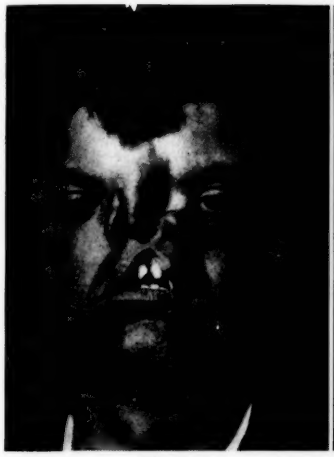

Fig. 1.

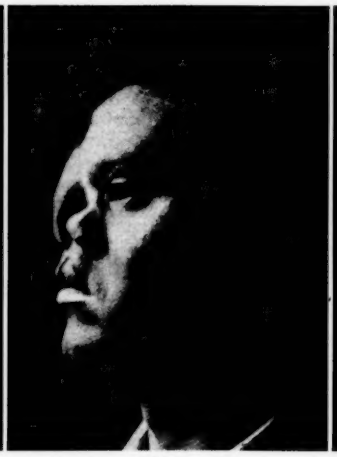

Fig. 2.

Fig. 3.

Fig. 1. Front view of a rare case of median cleft of the nose with cleavage of the right ala and true median harelip.

Fig. 2. Side view of same patient shown in Figure 1.

Fig. 3. The same patient after surgical correction of the lip and nose with a forehead flap.

meter embryo. In the former the nostrils are separated by a furrow, the eyes are wide apart, and there is absence of the nasofrontal angle; a double septum may be present also. In the latter there are two olfactory grooves separated by a nasal bud in which there is a vertical fissure. When the fissure fails to close, the cells in either side, which ultimately form the adult septum, develop into two septa instead of one. The conclusion is that there is a primary cessation of development at this stage with failure of normal union of the two halves of the nose.

Median cleft varies because of different degrees of malformation. The most frequent type presents a notching of the tip. The cases presented in this paper, however, had cartilaginous and bony deformities also. The nose was greatly enlarged and flattened, and sometimes formed a groove. The width of the tip was exaggerated and there was separation of the nares. The base of the nose was widened with a pronounced increase in the distance between the eyes and there was an enlargement of the whole upper face. The upper lip may be short or notched and may show scars on its surface. The profile of the severe type was characterized by the absence of the nasofrontal angle, an absent tip, and a short nose, which resulted in a continuous line from forehead to upper lip.

When the cartilages alone are involved, the triangular cartilages fail to join at the correct angle to form a normal bridge and the alar cartilages likewise do not come together in the median line. In the severe cases there may be a bony diastasis and one can feel the anterior border of the frontal process of the maxilla directed sagittally. The nasal bones proper are rudimentary and may lie either in a sagittal plane or form the floor of the dorsal groove. The cartilaginous septum is thickened if a double septum is not present.

There was 1 case of imperforate nasal passages, but in all the others the passages were patent. The sense of smell was normal. Various types of harelip and other congenital anomalies have been observed in association with median cleft of the nose.

Of the 11 cases reported 5 were in one family. There were 6 children (3 boys and 3 girls), 4 of whom (2 boys and 2 girls) had median cleft. A first cousin of these children had a similar deformity.

The author suggests 3 types of correction depending on the severity of the condition. In the mild cases she shapes the alar cartilages and uses any resected pieces to fill the median depression. In the intermediate cases she readjusts the soft tissues and fractures the bones of the nose to permit moving them to the correct position. Often, however, cartilages or bone grafts are necessary. In the extreme cases it is necessary to utilize a pedicled flap, from the forehead, to supplement the inadequate skin of the nose.

By surgical methods one can obtain good results except in the correction of the wide separation of the eyes. BRADFORD CANNON, M.D.

MOUTH

Roux-Berger, J. L., and Jadlovker, M.: Lymphatic Invasion in Cancer of the Base of the Tongue (L'envahissement lymphatique dans les cancers de la base de la langue). *Presse méd.*, Par., 1940, 48: 249.

In 225 cases of cancer of the base of the tongue under observation at the Curie Foundation, Roux-

Berger and Jadlovker did not find any evidence of retropharyngeal metastases. The glandular involvement was not as extensive as in cancer of the anterior portion of the tongue, but it was more frequently bilateral. This is due to the fact that the primary lesion is more frequently bilateral. The bilateral extension of cancer of the base of the tongue occurs because diagnosis is rarely made in an early stage. The only symptom noted by the patient is some difficulty in swallowing, which is frequently treated as a sore throat. Diagnosis might be made at this time, however, by digital examination and without the aid of the pharyngoscope, which would show a small area of induration, often unilateral. If treatment were instituted at this early stage, bilateral involvement would be avoided.

In the 225 cases of cancer of the base of the tongue examined, there was clinical evidence of glandular involvement: in 97 bilateral lesions of the tongue the glands were involved on both sides in 61 cases, on one side in 28 cases, and not involved in 8 cases. In 128 cases in which the tongue lesion was unilateral, the glands were involved on both sides in 44 cases, on one side in 71 cases, and not involved in 13 cases. The percentage of bilateral involvement of the glands was, therefore, much higher in those cases in which the tongue lesion was also bilateral.

In 167 cases of cancer of the tongue that were treated in the period from 1919 to 1933, there were 16 cures of more than five years' duration; in 42 cases the lymphatic glands were removed at operation and examined histologically. In 6 of these cases only the submaxillary glands were removed; in 3 of these the glands were examined histologically and found to be carcinomatous in 2. In 3 of these cases it is known that there was a glandular recurrence involving the carotid glands bilaterally. In the 36 other cases, the satellite glands were completely removed, i.e., the submaxillary, carotid, and supraclavicular glands. In the 42 cases in which the glands were removed surgically, there were 34 deaths and 8 recoveries. In 5 cases death was due to local recurrence, in 10 to recurrence in the glands, and in 4 to local and glandular recurrence. Glandular recurrences most frequently involved the carotid glands. The glands were involved in 4 of the 8 cases in which a five-year cure was obtained. In all these 8 cases the lingual lesion was unilateral, but in the 4 cases in which the glands were involved, the clinical evidence indicated that this involvement was bilateral; yet cure was obtained by a unilateral operation.

It is evident that bilateral carcinomatous involvement of the glands is not as frequent as the clinical evidence of adenopathy indicates. As cancers of the base of the tongue are definitely radiosensitive, it may be hoped that radiotherapy will also prove effective against the glandular involvement.

ALICE M. MEYERS.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Lilja, B.: Displacement of the Calcified Pineal Body in Roentgen Pictures as an Aid in Diagnosing Intracranial Tumors: An Anthropometricostatistical Analysis. *Acta radiol.*, 1939, Supp. 37.

This monograph is one of the most detailed and statistically complete modern treatments of the subject of the pineal gland and its position in the normal and diseased brain. The object of this work is (a) to determine the range of variation for the normal position of the pineal body, and (b) to demonstrate the position of the pineal body in patients showing verified tumors and to compare these data with the normal material.

In a series of 808 normal cases, the pineal gland was observable in the roentgen pictures with a frequency of 37.13 per cent. All persons twenty years of age or older were considered together in one group, since the variations in the subgroups after twenty years are not significant. All roentgenograms were made with the standard technique of Lysholm. The roentgen tube was movable along a semicircular arc which could be turned so that the distance between focus and film always remained 65 cm. The distance from the table top to the film surface was always 4 cm.

The established values of the radii from the pineal gland were affected by the varying size of the crania. All the radii and diagonals employed for the position of the pineal body were established according to an available large series of skull plates made from the anthropometrical and statistical points of view. The variations found by the author in his normal material were compared with those of several other large anthropological series, Swedish as well as those of other nationalities. Because of the variations of the size of the skulls, the radii were expressed in percentage relations to the length and height of the crania, all craniometric points being situated on the inside of the cranium. The radii, the direction of which corresponds most closely to the length of the cranium (No. 1–3 and 7–9), were calculated as percentages of the length (glabella-lambda), and the other radii (No. 4–6 and 10–11) were similarly related to the height of the cranium (vertex-opisthion) (See author's Diagram 1 and Table I).

Using the same x-ray technique as for the normal series, the pineal shift was studied in 217 patients with verified intracranial tumors. Variations in the standard radii were found to occur in 50 per cent of 139 cases of supratentorial tumors and in 14 per cent of 78 cases of infratentorial tumors. In the frontal projection the position of the pineal gland was determined in 51 cases. Only 53 per cent of 34 cases of supratentorial tumors showed a lateral displacement of 3 mm. or more, and the pineal gland

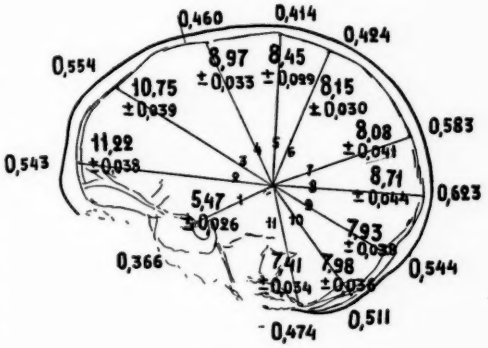

DIAGRAM I.

MEANS, IN CM., STANDARD ERRORS AND STANDARD DEVIATIONS OF THE DIFFERENT RADII FROM THE PINEAL BODY

TABLE I.—THE LIMITS OF PROBABILITY ESTABLISHED IN THE NORMAL MATERIAL FOR THE MEASUREMENTS OF THE RADII FROM THE PINEAL BODY, IN PER CENT OF THE LENGTH AND HEIGHT OF THE CRANIUM.

Radius No.	Outside M ± 3σ Probabil. 1:370		Outside M ± 2.5σ Probabil. 1:80		Outside M ± 2σ Probabil. 1:22		Outside M ± 1.5σ Probabil. 1:7		Outside M ± σ Probabil. 1.3	
	smaller than	larger than	smaller than	larger than	smaller than	larger than	smaller than	larger than	smaller than	larger than
1	23.14	34.66	24.10	33.70	25.06	32.74	26.02	31.78	26.98	30.82
2	52.70	66.20	53.83	65.07	54.95	63.95	56.08	62.82	57.20	61.70
3	49.12	64.48	50.40	63.20	51.68	61.92	52.96	60.64	54.24	59.36
4	49.81	64.37	51.02	63.16	52.23	61.95	53.45	60.73	54.66	59.52
5	48.55	59.07	49.43	58.19	50.31	57.31	51.18	56.44	52.06	55.56
6	44.77	58.95	45.95	57.77	47.13	56.59	48.31	55.41	49.50	54.22
7	36.86	48.66	37.84	47.68	38.83	46.69	39.81	45.71	40.79	44.73
8	39.20	52.96	40.35	51.81	41.49	50.67	42.64	49.52	43.79	48.37
9	33.73	48.67	34.97	47.43	36.22	46.18	37.46	44.94	38.71	43.69
10	43.12	58.56	44.41	57.27	45.70	55.98	46.98	54.70	48.27	53.41
11	41.05	53.41	42.08	52.38	43.11	51.35	44.14	50.32	45.17	49.29

The measurements of radii 1–3 and 7–9 are calculated as percentages of the length of the cranium (glabella-lambda), and those of radii 4–6 and 10–11 as percentages of the height of the cranium (vertex-opisthion).

invariably showed a median position in 17 cases in which the tumor was situated in the posterior fossa.

When the tumors were of supratentorial location, the backward-downward displacement was definitely predominant. No differentiation of the displacement in different directions in the sagittal plane according to the varying positions of the tumors was observable, but the position of the tumors proved to be of decisive importance to the lateral displacement. In the cases in which such a lateral shift occurred, it was always to the side opposite the tumor. From the material at his disposal, Lilja was unable to tell whether the histological structure of the supratentorial tumors affects the position of the pineal gland.

JOHN MARTIN, M.D.

Kabuki, Y.: An Experimental Contribution on the Subject of Epidural and Subdural Hematomas and on the Therapeutic Significance of Dehydration and Repeated Cysterna Puncture (Experimentelle Beitraege zur Frage der Epi- und Suduralhaematome und zur therapeutischen Bedeutung der Dehydration und wiederholten Zisternenpunktion). *Arch. f. klin. Chir.*, 1939, 197: 228.

Epidural and subdural hematomas were produced experimentally in dogs. Their own blood was injected in amounts of 1 c. cm. per kilo of body weight. The technique is described in detail and care was taken that no return flow occurred. A total of 88 experiments were made, 45 epidural and 43 subdural. In 25 experiments a dehydration treatment was instituted for seven days following the operation, and in 23 experiments a continuous decompression was maintained in addition by repeated cysterna puncture (7 times in two or three days). A detailed description of the findings is given in 15 microscopic pictures.

In both types of hematoma, organization commences within a few days after the operation from the dura side and is completed within fourteen to twenty days. In subdural hematoma the organization is completed by the dura alone; in epidural hematoma there is also a hyperplasia of the endothelium and of the different cells from the bony side. In all the experiments a thin fibrous layer was observed at the beginning of the organization which was first considered as of mesothelial origin. Just as in clinical observations in subdural hematomas there were numerous capillary spaces lined with endothelium, especially in the neighborhood of the dura. Characteristic of them was the fact that they were surrounded by lattice-like fibers and the neighboring tissue was loosely formed. From ten to fourteen days after the operation there were also calcified areas demonstrable, much fewer, however, in the epidural type. Dehydration produced no change in the course of the organizing process. Repeated cysterna puncture seemed to hasten the organization. The organized tissue, however, remained soft and spongy, and it seemed to be less than in the other cases. The liquor showed no changes in the epidural cases except a slight increase in the cell count; in the subdural cases there were hemorrhagic and, later, xanthochromic changes with strongly positive albumen reactions. Among the clinical phenomena (pressure pulse, pressure respiration, paresis of the opposite side), subconjunctival bleeding occurs usually on the side of injury; no explanation is given for its cause. The frequently observed secondary hemorrhages occur in the loosely woven layer between the dura and the hematoma. They probably originate in the blood spaces and capillaries. This phenomenon is discussed in the literature thoroughly. In regard to the delayed healing in intracranial hemorrhages these secondary hemorrhages may play an important rôle.

(WANKE). LEO A. JUHNKE, M.D.

Chao, Yi-Cheng, Humphreys, S., and Penfield, W.: A New Method of Preventing Adhesions: The Use of Amnioplastin After Craniotomy. *Brit. M. J.*, 1940, 1: 517.

Laceration of the brain which is the outcome of gunshot wounds of the head, depressed fractures of the skull, and craniocerebral operations results in meningocerebral adhesion. The adjacent brain comes to be vascularized through a scar from extracerebral blood vessels. This is a most important element in the production of post-traumatic epilepsy.

Steinthal and Nagel concluded that severe injury to the brain resulted in frank epilepsy in 28.9 per cent of the cases, and lesser forms of epilepsy in 35.5 per cent, a total of 64.6 per cent. The secret of the high incidence of post-traumatic epilepsy must lie in the scars that result from such injuries. The epilepsy may appear at any time up to ten or fifteen years after the injury. Head injury without penetration of the dura rarely results in epilepsy, although the brain damage may be, and often is, severe.

The authors experimented on dogs with numerous substances with the hope of discovering one which would allow healing of the meninges without scar formation. They found that amnioplastin, which may easily be prepared from membranes available in any delivery room, allowed such scarless healing of the meninges. Detailed directions for the preparation and use of amnioplastin are given in the article. The authors recommend amnioplastin also for the prevention of adhesions in the peritoneal and joint cavities and about tendons and sutured nerves.

DAVID J. IMPASTATO, M.D.

Haertel: The Technique of Injection of the Gasserian Ganglion (Zur Technik der freihaendigen Ganglionpunktion). *Zentralbl. f. Chir.*, 1939, p. 2475.

There are two methods by which painful sensation may be interrupted: the operative, by cutting of the sensory root according to the method of Frazier or Dandy, or by the more severe method of Sjoequist; and the conservative-surgical method of alcohol injection or electrocoagulation. The Kirschner focusing apparatus is superfluous as the injection is

easily accomplished and possible without any complicated apparatus. Haertel proceeds in the following manner: the skin is anesthetized locally, an incision is made, and a cannula is led to the base of the skull. An injection of from 5 to 10 c.cm. of ½ per cent novocaine is given. A short chlorethyl anesthesia is now given in order to enter the foramen, and then an injection of novocaine is made into the ganglion. X-ray control of the position of the needle is necessary and then the injection of alcohol into the ganglion may be made without any pain. The author does not recommend general anesthesia for with its use neurological control is lost. The injection of scopolamin-eukodal-ephetonin acts irregularly and is therefore not employed. Evipan and resuscitation with coramine before the alcohol injection is made is ideal but complicated and is used only for special cases.

The stereoscopic control of the needle with x-rays is advised. The pictures are taken with the patient lying on his abdomen and the central ray is directed nearly in the axis of the cannula.

Electrocoagulation is somewhat more complete but is limited to circumscribed foci, whereas the alcohol distributes itself more evenly. A complete destruction of the tissue is not necessary as only the pain fibers and those controlling the temperature sense should be interrupted. Alcohol, in contrast to coagulation, does not affect the tactile sense.

The danger of keratitis and recurrence of the attacks depends upon the depth and extent of the anesthesia. The trophic disturbance of the cornea incident to total anesthesia will adjust itself in time so that the protective glasses may be removed later. The keratitis does not occur if the eye is gradually accustomed to the anesthesia and prepared beforehand by a partial or incomplete anesthesia. If a total destruction is necessary later on account of a recurrence there is no harm done. It is better, however, to proceed gradually and let recurrences take place, and eventually the disease will be overcome.

In the discussion SCHOENE praised the alcohol injection which has been successful in all of his cases. He does not use a focusing apparatus and the foramen is but rarely x-rayed. In the aged the ganglion may become so thin that it is very easy to go beyond it. Anesthesia of the skin and the soft parts is produced with ½ per cent novocaine, and of the base of the skull with a 2 per cent solution. In a few cases Schoene uses a chlorethyl narcosis for a few moments when puncture of the ganglion is done. He injects a 2 per cent anesthetic solution into the ganglion. He recommends a syringe with a screw-thread end so as to be able to inject slowly and visualize the amount injected. With the appearance of muscular weakness the injection is stopped immediately.

All of the pareses disappeared again. Freedom from pain was obtained in all but an occasional case; not seldom, however, one must secure total anesthesia of the respective side of the face to effect a cure. Tactile sensation is somewhat impaired in most cases. The injection cannot be given so perfectly in all cases that trophic disturbances of the cornea do not occur. With increased experience the amount of alcohol injected is small. Schoene used from 0.3 to 0.8 c.cm.

The intracranial severing of the sensory root does not only sever the fibers of pain sense but also those of the tactile sense. However, an ideally executed severance may save the fibers to the eye. The same result may be obtained also with an alcohol injection but not with certainty. This procedure also should be done by an experienced operator.

SAUERBRUCH states that the literature reports but few of the late sequelæ. In his clinic the Kirschner method is employed.

ADLER reported that in 1 of his cases a severe keratitis led to blindness. Also, after electrocoagulation he saw a stroke-like paralysis of the left side, but it gradually receded.

HAERTEL in closing said that conduction anesthesia of the ganglion is necessary only occasionally. In resections of the ulcerating upper jaw it should not be employed because of the danger of meningitis. Abducens paralysis has not been seen during the last few years, formerly it was more frequent. Haertel does not employ electrocoagulation on account of the greater danger; however, he states that the alcohol injection in inexperienced hands may do considerable damage. (Peiper called attention to this before.) After the first few injections the author has not seen any bad results during the past twenty-six years. The technique cannot be described, it must be seen and then practiced.

(SCHAEFER). LEO A. JUHNKE, M.D.

SPINAL CORD AND ITS COVERINGS

MacFee, W. F.: Cervical Rib Causing Partial Occlusion and Aneurysm of the Subclavian Artery. *Ann. Surg.*, 1940, 111: 549.

In a study of 360 cases of cervical rib with pressure symptoms 235 presented nerve symptoms alone, 106 nerve and vascular symptoms, and 19 only vascular symptoms. Among the 125 cases with vascular symptoms there were 27 in which a fusiform, aneurysmal, or cylindrical dilatation was observed. Six cases presented gangrene of the fingers.

Knowledge regarding the manner of production of the vascular changes is still lacking. Of the three main factors, pressure by the anomalous rib, pressure by the anterior scalene muscle, and paralysis of the sympathetic fibers passing to the vessel, the last seems the most important, in view of the observation that vascular changes may be present when the cervical rib impinges only on the brachial plexus, and the persistent anatomical endarteritis distal to the constriction which is occasionally found, as in the author's case.

The case reported is that of a twenty-eight-year-old white male. The tips of his left thumb, index and middle fingers showed dry, blackened, gangrenous areas. In the left supraclavicular region there was a hard, raised structure above which a pulsating

vessel could be felt. The left arm showed slight general atrophy and the left hand was cyanotic. The brachial artery below the middle and distal thirds of the humerus felt like a hard, pulseless cord. There were no pulsations in the left forearm, wrist, or hand. There were no focal areas of sensory or motor disturbances to indicate involvement of the brachial plexus. A roentgenogram of the spine showed an incompletely developed cervical rib on each side.

At operation the anterior end of the cervical rib formed a mass of rounded, dense cartilage. The subclavian artery lay in the narrow space between the scalenus anticus tendon and the end of the rib and was tightly compressed. Immediately distal to the point of compression, the artery presented a fusiform aneurysmal dilatation. The brachial plexus lying posterior and lateral to the artery passed over the cervical rib and suffered no interference. The tendon of the scalenus was severed near its attachment. The cartilaginous mass at the tip of the rib was removed. Relief of the pain was immediate, but the fingers did not heal completely for about six months. The pulsations in the wrist did not return.

About nine months after the operation the patient began to feel pain in the left shoulder which later radiated along the medial surface of the arm, forearm, and hand. It was apparent that the brachial plexus was involved and a second operation was performed. It was found that the portion of the rib removed at the first operation had partially regenerated and there was new bone and scar formation sufficient to compress the plexus against the clavicle. The aneurysmal dilatation of the subclavian artery, observed at the first operation had almost disappeared and the vessel at this point was approximately of normal caliber. The painful symptoms subsided after ablation of the rib. The author believes that the cervical rib should have been completely removed, or not disturbed at all, at the first operation. DAVID J. IMPASTATO, M.D.

Smith, B. C.: Thrombosis of the Third Portion of the Subclavian Artery Associated with Scalenus-Anticus Syndrome. *Ann. Surg.*, 1940, 111: 546.

Thrombosis of parts of the subclavian artery is relatively rare; this case concerns thrombosis of the third part of the left subclavian artery which simulated coronary disease. In spite of confusing anatomical terminology, the author's idea of the cause of the condition is brought out. The patient presented himself with pain in the left chest and down the left arm, associated with dyspnea on slight exertion; he could not use his left arm as a soda dispenser for more than four hours at a stretch. On examination, the blood-pressure readings were less in the left arm, as were the oscillometer readings. There was atrophy of the thenar eminence and the whole head and forearm were cyanotic.

At operation, the scalenus-anticus muscle was divided, which exposed the subclavian artery; the branches of the second part were seen. The third part of the artery did not pulsate, because of a band of fascia posterior to the scalenus muscle which constricted it. A needle was inserted distal to the constriction, but blood could not be obtained. The prevertebral fascial band was released, but pulsation did not appear in the third part of the artery. The postoperative course was uneventful. Ten months later the patient was symptom-free and there was only a slight decrease in the oscillometric readings of the left arm. ADRIEN VERBRUGGHEN, M.D.

Patterson, R. H.: Cervical Ribs and the Scalenus-Muscle Syndrome. *Ann. Surg.*, 1940, 111: 531.

A brief résumé of the comparative anatomy of cervical ribs leads insensibly to the discussion of their occurrence in the human being. It is interesting to note that lumbar ribs are much more common in man than cervical ribs. The syndrome of the scalenus-anterior muscle is described, with mention of the fact that the same syndrome may be produced, in the absence of extra ribs, by the hypertrophied scalenus-anterior muscle.

The paper is based on the study of 31 cases of the scalenus syndrome. Excellent diagrams of the variations in the extra ribs are presented. Sixteen of the 31 patients had symptoms due to irritation or pressure on the brachial plexus or subclavian artery. Although the lower part of the plexus was most commonly affected, in one case or another all of the components of the plexus were involved. Pain was the most common complaint. Of the 16 patients, 10 had extra ribs and 6 had enlarged transverse processes and hypertrophied scalenus-anterior muscles. All of the patients with extra ribs were between twenty-one and thirty years of age, 7 of whom were operated on. In the group with the scalenus syndrome alone, the patients were between twenty and thirty years of age, and 3 of the 6 were operated on.

In this article it is recommended that the scalenus-anterior and the scalenus-medius muscles be divided, along with removal of part of the cervical rib, if the artery is not freed by division of the muscles. To avoid the pleura, the author suggests that the muscles be divided 2 in. above their insertions. The "fibrous band" must be found and divided; it usually arises from the tip of the extra rib and joins the scalenus-anterior muscle.

The differential diagnosis is carefully worked out, especially from common conditions which at first could be mistaken for this syndrome. The scalenus-anterior syndrome is much more common in the absence of extra ribs than with them. The article is most instructive, although the surgical procedures recommended are somewhat more radical than those usually carried out by other surgeons.

ADRIEN VERBRUGGHEN, M.D.

Neri, V., and Putti, V.: Operative Intervention in 2 Cases of Vertebral Angioma (Intervento in due casi di angioma vertebrale). *Riforma med.*, 1940, 56: 3.

Including the 2 cases presented by the authors, only 16 cases of vertebral angioma have been oper-

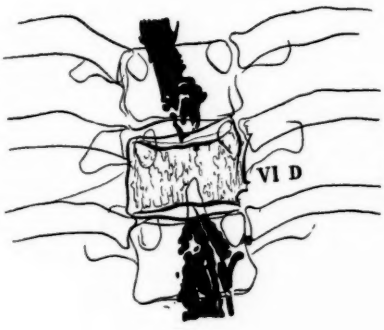

Fig. 1.

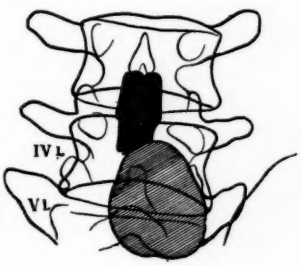

Fig. 2.

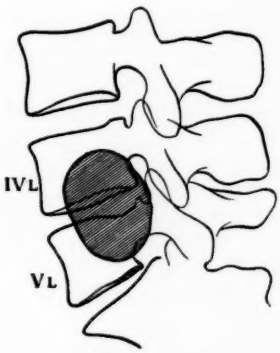

Fig. 3.

Fig. 1. The shadow of the lipiodol, ascending and descending, limits the zone of compression. The body of the sixth dorsal vertebra shows the reticulated appearance of the angioma.

Figs. 2 and 3. The shadow of the lipiodol stops on the superior pole of the mass which occupies part of the bodies of the fourth and fifth lumbar vertebræ.

ated upon. The operative mortality is reported as 60 per cent.

The first case was that of a forty-seven-year-old woman who at the time of operation presented signs of a level lesion at the sixth dorsal segment, with subarachnoid block, arrest of lipiodol at the sixth dorsal vertebra, and the typical striated appearance of angioma of the sixth dorsal vertebra (Fig. 1). At operation the spinal compression was being caused by a mass arising from the posterior surface of the body of the sixth dorsal vertebra. While attempts were being made to remove some of this tissue a severe hemorrhage occurred from which the patient died.

The second case was that of a forty-one-year-old male who presented signs and symptoms of compression of the sacral segments. X-rays showed a smooth ball-like mass involving the fourth and fifth lumbar vertebræ (Figs. 2 and 3). During the operation it was noted that the arches of the fourth and fifth vertebræ were very friable. The meningeal tube was reduced in size and pushed to the right; it occupied about one-third of the canal. The other two thirds were occupied by a yielding mass. When attempts were made to remove this mass a severe hemorrhage occurred. This was controlled by gauze packing. This patient made a good recovery.

DAVID IMPASTATO, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Di Paola, N.: The Use of Tannin and Formalin to Delay Osseous Regeneration after Subperiosteal Resection (Sull'impiego del tannino e della formalina per ritardare la rigenerazione costale dopo resezione sottoperiostea). *Clin. chir.*, 1940, 16: 119.

Di Paola recalls his previous paper on the prevention of osseous regeneration, in which it was concluded that both the thermocautery and silver nitrate were not only ineffective, but even dangerous as agents for the prevention of osseous regeneration, and that a solution of formalin (10 to 20 per cent) was best adapted to that purpose.

In the current paper the author reports on a series of 10 rabbits in which subperiosteal resections were done, certain animals being treated with a 10 per cent solution of formalin, and certain others with a 20 per cent hydro-alcoholic solution of tannin. In a third group the superior portion of the periosteum was treated with tannin, and the inferior portion with formalin, in order that differences should be more clearly marked. The animals were observed for a period varying from two to six months, after which they were killed and the tissues examined both histologically and roentgenologically. Of the 5 rabbits treated with tannin, 2 died after two days of a fibrinous pleuritis due evidently to the penetration of the material, and in all cases notable retraction of the surrounding tissues was found, involving even the pleura. Regeneration, on the other hand, was present after fifty days. The animals treated with formalin showed no trace of regeneration after more than three months, and damage to the surrounding tissues was found to be negligible. It was concluded, therefore, that formalin was the optimum substance for the preparation of the resected ribs.

EDITH FARNSWORTH, M.D.

Taylor, H. C., Jr., and Waltman, C. A.: Hyperplasias of the Mammary Gland in the Human Being and in the Mouse: Morphological and Etiological Contrasts. *Arch. Surg.*, 1940, 40: 733.

The authors discuss the histology of the two major forms of chronic cystic mastitis, namely, adenofibroma and hyperplasia of the ducts. They reiterate that in order that a claim can be made that "chronic cystic mastitis" has been reproduced experimentally in animals, at least a fair proportion of the morphological forms of the human disease must be demonstrable. These are summarized as follows:

1. Adenofibrosis
   a. Fibrosis of the lobule
   b. Diffuse proliferation of normally constructed acini with connective tissue
2. Abnormal acinar proliferation
   a. Multiplication of cell layers lining the acini
   b. Multiplication of small acini in lobular arrangement
   c. Loss of lobulation by diffusion of acini
   d. Appearance of solid tubules and coalescing cell masses
3. Non-neoplastic disease of the ducts
   a. Dilatation of the ducts with secretion in the lumens
   b. Inflammation of periductal tissues
   c. Abnormal function or degeneration of epithelium
4. Abnormal proliferation of duct cells
   a. Sweat-gland epithelium
   b. Neoplastic proliferation of the ducts
      (1) Groups of cystic ducts
      (2) Reduplication of the cells lining the ducts
      (3) Formation of "arcades"
      (4) Occlusion of ducts by cells
      (5) Papillomas.

Evidence is then presented that there are at least two, and possibly more, separate entities which have been called chronic cystic mastitis. The first type is characterized clinically by a diffuse nodularity, more marked in the outer quadrant, and by premenstrual pain. On gross section an increase in fibrous tissue is often evident. The basic histological lesion is fibrosis or adenofibrosis involving the interstitial fat as well as the periacinar tissue. The ducts are relatively little affected. Dilatation of the glands and various evidences of epithelial hyperplasia are important and frequent complications, but do not characterize the disease. The condition is analogous to adenomyosis of the uterus and should be termed adenofibrosis.

A second definite type of mammary disease is characterized by a discharge from the nipples, often associated with palpable dilatation of the ducts near the areola. The basic histological observations are edema of the lobules with perhaps some evidence of secretion in the cells, dilatation of the ducts, periductal inflammation, and possibly some hyperplasia of the lining of the ducts. Depending on the conditions present, the disease should be termed non-puerperal lactation, periductal inflammation, or duct hyperplasia.

A third type is perhaps to be recognized in lesions arising more or less locally, such as a single papilloma in the larger ducts or the isolated nodules of Schimmelbusch's disease.

The exact character of the individual lesions of chronic cystic mastitis and the association of certain of these to form separate entities must be recognized before any comparisons can be made with the lesions artificially produced by the administration of endocrine substances to the lower animals.

The authors next consider the subject of endocrine dysfunction in women with chronic cystic mastitis. While patients with chronic mastitis have disturbances of the menses in only a minority of the

cases, they have them more frequently than normal women. A decrease in the amount and duration of the menstrual flow in the cases of painful nodular breast (adenofibrosis) was evident in about a fifth of the authors' series. The consistency with which this rather uncommon anomaly of menstruation has been reported in this type of case appears to establish its association with the disease. In 6 of 11 cases of milk-like secretion a delay in menstruation was noted. This delay in menstruation may be accepted as a characteristic of many patients with anomalous secretion from the breasts. Reference is made to organic abnormalities of the pelvic organs, particularly multiple follicle cysts of the ovaries. While the significance of these in relation to the origin of chronic mastitis is not obvious, the ovarian findings assume more importance in the light of those described later in the article in mice susceptible to mammary carcinoma.

The mammary glands of two strains of mice differing as regards their susceptibility to mammary carcinoma were studied, and striking differences of structure were noted as early as the third month of life. The essential difference was a vast increase in the number of acini in the cancer-susceptible strain. The human pathological lesion which this picture resembled most closely was the rather infrequently encountered acinar proliferation, occurring in small foci and sometimes termed adenosis. The more commonly described characteristics of so-called chronic cystic mastitis, the development of new fibrous tissue, the periductal inflammation, and the intraductal epithelial proliferation, were not observed to occur spontaneously in mice.

The two strains of mice were also studied from the standpoint of their endocrine constitution. The ovaries, uterus, adrenals, thyroid, and pituitary glands were studied. A difference in the endocrine glands of these two strains of mice seems a priori probable. The strain with excessive mammary proliferation has been shown by this study to have a much larger ovary and one containing many more corpora lutea than the cancer-resistant strain. Less striking differences were probably present in the adrenal glands and perhaps in the thyroid gland. Characteristic differences in the anterior lobe of the pituitary gland may exist but must be sought with a more intricate histological technique than was employed in this work. It must, of course, be remembered that neither of the strains studied is necessarily representative of all the cancer-susceptible or of all the cancer-resistant groups. The differences in the ovaries of the two strains should, however, draw attention once more to morphological examination of the ovaries of women with hyperplastic and neoplastic disease of the breast.

Experiments were performed upon the two strains of mice, directed not toward the production of mammary carcinoma but toward the development of benign lesions, and particularly toward a study of their morphological similarity to one of the forms of human chronic mastitis. The experiments consisted in the examination of the breasts of the mice to note the effect of the injection of estrone (amniotin), estradiol benzoate (estroform B), gonadotropic substance from the urine of pregnant women (follutein), and the lactogenic principle of the anterior pituitary gland (prolactin), respectively.

It was found that the basic difference in the structures of the mammary gland of the two strains is persistent no matter what endocrine principle is injected. The authors describe in detail the various morphological changes produced by the various endocrine principles used in the experiments. They conclude that the characteristic lesion arising spontaneously in the mammary gland of mice susceptible to carcinoma and that produced by estrogenic substances is a diffuse adenomatous proliferation of acini. Morphologically similar structures are sometimes seen in human mammary disease, but their presence does not constitute an essential feature of "chronic mastitis." The diffuse fibrosis or adenofibrosis which is characteristic of the commonest form of benign mammary disease in women has no morphological counterpart in the lesions of the mammary glands of mice, whether spontaneous or induced by the administration of endocrine substances. The human disease characterized by retained secretion in dilated ducts, moderate hyperplasia of the lining of the ducts, and signs of periductal inflammation is rather closely imitated by lesions in mice developing after the prolonged administration of endocrine substances, especially of estradiol. Complex neoplastic lesions of the lining of the ducts occurring in the human breast, such as papillomas or proliferations of the epithelium which fill the ducts completely, do not develop in the mouse spontaneously or after prolonged administration of estrogens. SAMUEL H. KLEIN, M.D.

Marques, M. F.: Malignant Lesions of the Breast (Lesões malignas da mama). *Arq. de patol.*, 1939, 11: 367.

The author studied the symptoms of cancer of the breast in 2,210 cases. During the same period of time 144 benign conditions were treated. Among the group of malignant cases there were only 35 men.

The author presents statistics based on 884 patients kept under observation for more than five years. The entire material is divided into two groups: the first was treated with x-rays only, while in the second surgical procedures were combined with pre-operative and postoperative irradiation. The second group is subdivided according to histological findings. The frequency of metastases in each subdivision was recorded.

The article is interesting chiefly from the standpoint of statistical data. JOSEPH K. NARAT, M.D.

Auchincloss, H., and Haagensen, C. D.: Cancer of the Breast Possibly Induced by Estrogenic Substance. *J. Am. M. Ass.*, 1940, 114: 1517.

The authors' patient was a forty-seven-year-old woman who on account of premenstrual headaches

was given estrogenic substance by mouth over a period of three months.

The authors are not able to state definitely that the estradiol benzoate (progynon B) was a contributing cause to the patient's carcinoma, but they think it entirely possible, indeed even probable, that it was. The problem can be definitely settled only by a careful and long continued follow-up of large numbers of women treated with estrogens.

At present the authors are sufficiently alarmed by their own experiences to warn against the needless and excessive administration of estrogenic substances so prevalent today. Until more is known about the effects of these substances they believe that their use should be avoided (1) in large or prolonged doses, (2) when there is a family history of breast cancer, (3) without initial and repeated clinical examination of both breasts, and (4) in patients with chronic mastitis, carcinoma, or any form of breast neoplasm, before or after surgical or radiation treatment. JOSEPH K. NARAT, M.D.

Brooks, B., and Daniel, R. A., Jr.: The Present Status of the "Radical Operation" for Carcinoma of the Breast. *Ann. Surg.*, 1940, 111: 688.

The radical operation for carcinoma of the breast is founded on a principle which makes it obligatory to assume that even a small difference in the technique would frequently produce a total difference in the result obtained. The authors call attention to the fact that the value of operative treatment of the breast is being questioned without sufficient analysis of the varying techniques employed. They also report the results in a series of cases each having the same operation, one that they believe conforms to the basic principles of the radical operation as devised by Halsted. The purpose of the operation is the extirpation of a single block of tissue so large as to include the breast, pectoral muscles, axillary contents, and also all of the intervening, and as much as possible of the surrounding, tissues. The surgical technique is described.

The authors are of the opinion that the extent of the disease as determined at operation or from subsequent study of the gross specimen is far more important in the prognosis than any classification of tumors according to the grades of malignancy. Their patients are divided into three groups. Group 1 contains the cases in which there was no demonstrable cancer outside of the mammary gland at operation as shown by subsequent gross and microscopic examination of the tissues removed. Group 2 contains the cases in which no cancer was observed during the course of the operation but later cancer was demonstrated in the inferior axillary lymph nodes by microscopic study. Group 3 was composed of the cases in which cancerous nodes were observed in the axilla or near the chest wall at the time of operation.

The results in 72 cases operated upon by the Halsted technique and classified into the three groups are reported. All patients have been operated on for more than five years.

There were 12 cases in Group 1, with 1 death from recurrence, which gave a five or more years' cure of 91.6 per cent. In Group 2 were 29 cases with 17 deaths from recurrence or a five or more years' cure of 34.5 per cent. There were 31 cases in Group 3 with 25 deaths from recurrence and 1 patient living with recurrence, or a five or more years' cure of 12.9 per cent; but 16.1 per cent of this group of patients were living five or more years. EARL O. LATIMER, M.D.

TRACHEA, LUNGS, AND PLEURA

Enquin, B.: Mediastinal Pneumonocele: Mediastinal Hernia of the Lung (El neumonocele mediastinal: hernia mediastinal del pulmón). *An. de la cátedra de patol. y clin. de la tuberculosis*, 1939, No. 2, p. 217.

Enquin states that during the past few years the occurrence of real mediastinal hernia of the lung, without relation to pneumothorax, has been reported. He distinguished: (1) mediastinal pneumonocele due to traction, which is more frequent than is usually thought and is of diagnostic importance from the surgical point of view because of the possibility of contralateral pneumothorax or pyothorax in the course of a plastic intervention or of a pneumonectomy; and (2) mediastinal pneumonocele due to autonomic pulmonary distention or to impulse, which is less frequent and offers particular interest because of its etiopathogenesis and its nosological affiliation with the classical spontaneous thoracic and cervical pneumonoceles.

There are three weak points in the mediastinal wall through which hernia may occur: the anterosuperior is the most important from the point of view of frequency and is located in the upper part of the anterior mediastinum above the upper sternopericardial ligament; the postero-inferior is located in the lower part of the posterior mediastinum, between the descending aorta and the esophagus (it is vulnerable only from the right to the left); and the third is found in the posterior mediastinum between the esophagus and the third, fourth, and fifth dorsal vertebræ.

Mediastinal pneumonocele due to traction should be suspected in any thoracic disorder which trespasses on the mediastinum. It occurs especially in adults of both sexes and may be caused by any sclerosing or atelectatic process, as pulmonary tuberculosis, bronchiectasis, cancer of the lung, and some congenital processes (fetal atelectasis and aplasia of the lung). Tuberculosis is the most frequent cause: usually, it is a chronic form of the disease with frank unilateral predominance and a marked tendency to fibrosis. The predisposing factors are the presence of the three vulnerable points in the mediastinum, the disposition of the costomediastinal pleural sinuses at the level of the anteroposterior weak point, the relations of the costal pleura with the thoracic wall at this point, and the degree of resistance of the hemithoracic wall to the pulmonary retraction. The determining factor

is the rupture of the equilibrium between the elastic tensions of the two lungs: the lack of proportion between the sclerosed or atelectatic lung and the capacity of its hemithorax causes aspiration or traction of the other lung through one of the vulnerable points.

The pneumonocele never causes functional disturbances of the mediastinal compression type and its presence can be suspected only by careful examination: there is a zone of highly located sonority at the side of the sternum, more pronounced during inspiration; at times, the heart sounds are heard suddenly further away at the base. Usually, pneumonocele is a roentgen finding, indicated by a vague clearing in the mediastinal space, easily confused with that of the displaced trachea. As a rule, it is necessary to use the technique of penetrating roentgenography (overexposed films taken with an antidiffusor) or of tomography to demonstrate the pneumonocele, which then appears as an abnormal clearing in the mediastinum. Differential diagnosis must be made from displacement of the mediastinum accompanied by non-hernial invasion of the opposite hemithorax by the healthy lung, deviations and angulations of the trachea, arched fibrous bands, and the course of the azygos vein which may imitate the contour of a pneumonocele.

Mediastinal pneumonocele due to autonomic pulmonary distention may occur in the course of some congenital or acquired pulmonary disorders, such as aerial cysts, polycystic dysgenesia, ampullar emphysema, bronchial obstruction by a foreign body, and some acute infantile diseases of the lung. It occurs especially in children and nurslings, and nearly always through the anterosuperior weak point. The determining pathological process is located in the herniated lung itself, which usually presents profound anatomical changes that are nearly always congenital. The other lung may be normal or show similar but more discrete changes. The appearance and development of the pneumonocele is favored by any factor that tends to increase the intrapulmonary pressure. In most cases, the pathogenesis of the distention is essentially bronchial. The pneumonocele may disappear when its determining causes cease to act, provided that the elasticity of the lung is sufficiently preserved.

The predisposing factors are the same as in the other varieties of mediastinal hernia. The chronic emphysematous or cystic form is usually asymptomatic and constitutes a roentgen finding. The acute form is characterized by suffocation, cyanosis, tympanism of the sternal and neighboring areas, displacement of the impulse of the apex of the heart, and venous distention in the neck. The evolution varies with the determining cause. Roentgen examination is indispensable for the diagnosis and lateral exposure is at times very useful. The differential diagnosis includes the determination of the presence of a mediastinal hernia and of its anatomicopathological variety: the latter is very difficult and requires differentiation between a giant cyst and spontaneous pneumothorax, which may even be impossible with exploratory thoracotomy and pleuroscopy.

As the disorder presents great analogies with extrathoracic spontaneous pulmonary hernias from the etiopathogenetic point of view, the classic chapter of hernias of the lung should be revised and amplified.

RICHARD KEMEL, M.D.

Bracco, A. N.: Continuous Aspiration for the Treatment of Pleuropulmonary Perforations and Caverns (Aspiración continua para el tratamiento de las perforaciones pleuropulmonares y de las cavernas). *Rev. Asoc. med. argent.*, 1940, 54: 65.

Bracco states that aspiration has two main applications in the treatment of pulmonary tuberculosis and of its complications: one is derived from the experiments of Monaldi (1938) in treating various types of cavern (intracavity aspiration), and the other fulfils the therapeutic requirements of emergency symptoms and provides the subsequent treatment for pulmonary perforations into the pleura which cause simple spontaneous pneumothorax or complicate artificial pneumothorax. In these two applications, the aspiration may be performed continuously or at intervals, but continuous aspiration is the most important and deserves special consideration because numerous opportunities for its use arise in daily practice.

The aspiration treatment of pulmonary perforations includes that of the acute, the subacute, and the chronic stages. In the acute stage, the treatment is directed toward the relief of the dyspnea. Interrupted extraction of air by means of the pneumothorax apparatus is indicated only in the treatment of small perforations in healthy tissue. The serious perforations require permanent drainage for which the use of needles and trocars is contraindicated, because they are incapable of establishing ample drainage; besides, they traumatize the tissue of the lung during its expansion, and the thoracic wall. On the other hand, it is difficult to keep them in a fixed position and they may get out of the pleural cavity and thereby cause symptoms of asphyxia which will require urgent measures. The sound of Nélaton only should be employed; it offers the advantage of allowing perfect drainage, it does not traumatize the tissues, and it permits the use of lavage as soon as empyema sets in.

Siphon drainage, according to Buelow, is sufficient in slight cases, but continuous aspiration is needed in general, and all the more in grave cases, in order to insure good results. The watertap may be used to create the necessary vacuum, and the valve of Jeanneret and Jolyet to regulate the vacuum, which should range from about −15 to −40 c.cm. of water. The aspiration drains the air and the pleural secretions. This is the only procedure which will allow the obtention of pulmonary expansion in grave cases of perforation which endanger the life of the patient. In the subacute and chronic stages, aspiration by itself may be a sufficiently efficacious method to obtain

the apposition and adhesion of the two pleuras. If this does not occur, thoracoplasty must be used in conjunction with aspiration. High degrees of vacuum should not be employed in these stages.

In the treatment of caverns, the method of Monaldi is giving very encouraging results. It allows occlusion of the caverns by re-expansion of the atelectatic pulmonary tissue: consequently, the treatment of pericavernous atelectasis is contraindicated because it is injurious. It also eliminates the factor of insufflation and the traumatism of cough, and it establishes drainage of the cavernous secretions. For this reason, its most typical indication is given by insufflated caverns with pericavernous atelectasis and wide open or only partially obstructed bronchi, and by caverns with insufficient drainage of their secretions. The association of thoracoplasty and cavernous drainage allows the solution of important problems. The indications and the end-results of the method cannot yet be stated with exactness. RICHARD KEMEL, M.D.

Vaccarezza, O. A. and Vaccarezza, R. D.: Partial Resection of the Scapula in High Thoracoplasties (Resección parcial de la escápula en las toracoplastías altas). *An. de la cátedra de patol. y clin. de la tuberculosis*, 1939, No. 2, p. 257.

The Vaccarezzas recommend partial resection of the scapula as a complement to partial upper thoracoplasty involving five or six ribs. It presents the following advantages: greater selectivity in collapse, greater economy in costal resection and in compression of the healthy areas, and elimination of static, esthetic, and functional disturbances of the shoulder. The resection should extend from the lower angle of the scapula upward as far as necessary to exceed the first non-resected rib. Generally the horizontal section reaches to from 4 to 6 cm. from the lower angle. The authors use this partial resection of the scapula as a complement to the partial thoracoplasty of Semb or of Graf-Schmidt. The resection of the scapula should be performed before that of the ribs because it provides a better field for the latter.

Local anesthesia is sufficient, and it is advisable to infiltrate also the insertions of the round muscle. Subperiosteal resection is preferable, provided that the periosteum is treated so as to avoid the subsequent formation of adhesions or osteophytes. Access to the bone is gained on the spinal border and in front of the insertion of the rhomboid muscle: the periosteum is elevated for a few centimeters on the superficial aspect of the bone, the insertion of the rhomboid is detached, and the deep aspect of the bone is denuded far enough to allow the application of a forceps to exert inward traction. Elevation of the periosteum is then continued on both aspects as far as necessary to resect the bone, the angles of which are then rounded off. The detached surface of the periosteum is electrocoagulated and the muscular flaps are sutured. This is followed by resection of the ribs.

The authors have used this method in 10 cases: in 4 Semb, and in 6 Graf-Schmidt operations. Excellent esthetic and functional results were obtained in all the patients. RICHARD KEMEL, M.D

Wood, W. B., Sellors, H., Roberts, J. E. H., Edwards, T., and Others: Discussion on Cystic Disease of the Lung. *Proc. Roy. Soc. Med.*, Lond., 1940, 33: 335.

According to Wood cystic disease in the lung consists of hydatid cysts and closed fluid cysts, both of which are rare. Dermoid cysts are in the mediastinum and not strictly lung cysts. Congenital cysts are not cysts in the pathological sense of the word; they are saccular formations which are not closed and which contain air.

Cystic disease in the living is difficult to recognize and to demonstrate, except by roentgenography and the introduction of opaque oils for lung delineation.

In the London Chest Hospital, 1,500 patients were admitted, and among these 20 were diagnosed as having "cystic disease of the lung." In another group of 89 patients with disease of the lung, 13 were found to have cystic disease.

The most common form of cystic disease of the lung is cystic bronchiectasis, which is strikingly different from saccular bronchiectasis. Balloon cysts are single and replace a large part of the lung. They are usually discovered in infants or young children. They have thin walls, and a tendency toward increasing inflation by check-valve action and they may lead to attacks of dyspnea.

Solitary cysts are smaller in size, and are usually discovered by accident. They do not cause symptoms unless infection converts such a cyst into an abscess. Bubble cysts often replace a large part of the lung by an aggregation of medium-sized cavities. There may be no symptoms unless infection supervenes, but such a lung is in constant danger of secondary infection.

Berry cysts are clusters of smaller cysts arranged in grape-like bunches. They often occur in the upper lobe where drainage is good. Fluid-filled cysts may discharge their contents after rupturing into a bronchus, and they may cause a spontaneous pneumothorax.

Cystic conditions in the lungs have been found at all ages and even before birth. The cysts appear to result from a failure of the extremely complicated system of lung budding which should proceed until the final alveoli are formed. The budding stops prematurely and the terminations of the already formed bronchi apparently swell out and thin out to occupy the spaces where pulmonary parenchyma should have developed, and dilated bronchi take the place of the lung alveoli.

In the treatment of cystic disease of the lungs, the risk of leaving a cystic lung alone must be compared with the risk of attempting its removal in every instance. The author suggests that balloon cysts in infancy and early childhood should be removed if they are causing symptoms. Cysts of the berry

cluster type should not be disturbed. Cysts of the bubble type should be removed by lobectomy or pneumonectomy if the condition is discovered in childhood and before secondary infection has produced a pus-sodden lung. When suppuration has occurred operation is too late. Before operation, exploration of the whole bronchial tree with lipiodol must be done.

Sellors states that cystic disease has two striking features, the regularity and constancy of the lining epithelium, and the erratic distribution and amount of supporting tissue. Fibrous tissue is the most common feature, but in some instances blood vessels, muscle, and mucous glands predominate to such an extent that a tumor formation has been suggested.

Mistaken diagnosis is very common in cystic disease. In cases of doubt the cavity should be opened and explored, and a piece of the wall removed for section.

Pneumothorax is likely to be confused with the large balloon type of cyst, and here the tomograph is of value in showing the continuous outline of the cyst against the chest wall. It may be difficult to distinguish tuberculous cavities from cysts, and emphysematous bullæ are similarly confusing, but prolonged observation will show some alteration in the size of the bullæ, but not in the cysts.

Multiple cysts or "honeycomb" cysts differ from bronchiectasis only as far as academic importance is concerned, but the treatment is the same.

Roberts believes that cystic disease and bronchiectasis could co-exist. Whatever might be said of operation in adults, removal of the offending lung or lobe should be done in children before infection occurs.

Edwards says that the most common complication in all varieties is secondary infection. Another complication is spontaneous pneumothorax. If and when a diagnosis is made in the unilocular and, particularly, giant cysts, the operation should be done as soon as the diagnosis has been made.

Thick-walled unilocular cysts when containing pus should be drained for several weeks before carrying out lobectomy.

According to Scadding the diagnosis of cystic disease of the lung in adults can be made with confidence only in a very small number. Cases in which infection has complicated the disease may have the identical symptoms of bronchiectasis, and the diagnosis will then be left in doubt.

Ellman believes that there is an association of congenital cystic disease of the lungs with cystic disease in other organs. This is true especially of large lobulated hydronephrotic kidneys with calcification in the cysts. J. DANIEL WILLEMS, M.D.

Huizinga, E.: The Origin of Bronchiectasis (Ueber die Entstehung der Bronchiektasie). *Acta radiol.*, 1940, 21: 75.

Huizinga endeavors to establish the causes of bronchiectasis chiefly by using a series of bronchograms from the same patient and by studying bronchograms taken during inspiration and expiration. He states that a single bronchogram may be misleading and illustrates this fact by reporting a case of a boy in which clinically and bronchographically the diagnosis of extended pulmonary abscesses had been definitely established and follow-up bronchograms taken after two-year intervals showed gradual diminution in the size of the cavities, and finally gave a picture of a typical bronchiectasis, which might have been considered congenital bronchiectasis. The author believes that bronchiectasis usually is an acquired condition.

His study is based on bronchographic examination of 100 children. The bronchiectasis developed after the entrance of a foreign body into the bronchial tree in 20 children, after pneumonia in 39, after pneumonia but with onset of the complaints before outbreak of the pneumonia in 8, and with a more indefinite history in 33.

The author agrees with Brauer's theory that the mechanical causes of bronchiectasis consist of loss of elasticity of the bronchi on the one hand, and in the traction forces influencing the bronchi from the outside on the other hand.

Bronchographic studies on normal individuals showed that the width of the peripheral bronchi varies greatly during the respiratory cycle, relatively much more than would be expected from the change in the lung volume. On the basis of these studies pleural adhesions cannot be held responsible as the cause of bronchiectasis in bronchi of reduced elasticity. Even in moderate expiration and inspiration, the differences are marked, especially in bronchi of diminished elasticity.

The author discusses the possibility that the loss of bronchial elasticity sometimes is only a result of the loss of muscle tonus. This theory, he believes, was borne out by the findings in the case of a girl of ten years who had marked bronchiectasis sixteen days after removal of a foreign body from the left main bronchus, while four months later the bronchogram was normal. On the other hand, bronchiectasis from shrinkage of connective tissue, as occurs after pneumonia, does not heal but rather develops more extensively in time, as the author demonstrates in the case of a girl, aged two, who developed bronchiectasis and displacement of the mediastinum after pneumonia. Roentgenograms taken when she was seven years old show an increase of both the bronchiectasis and the mediastinal displacement.

Atelectasis can lead to bronchiectasis just as shrinkage of the connective tissue does, but changes due to atelectasis are reversible. The author illustrates this with the report of a case of a boy of one and one-half years who had inhaled a peanut four months before admission. It was removed bronchoscopically from the left main bronchus, and extended bronchiectasis with mediastinal displacement was found, but eleven months later normal bronchograms were obtained. In this case the air behind the obstacle had been resorbed and atelectatic collapse (Coryllos and Birnbaum) had developed. The other

possibility, replacement of the air by transudation or, after the transudate becomes infected, by exudation, does not lead to a quick shrinkage of the involved lobe.

Atelectatic collapse often leads to complete shrinkage of the lower lobes (Chauffard's triangle), and produces a condition which formerly often had been mistaken for mediastinal pleuritis. Experience shows that bronchiectasis is always present in such shrunken lower lobes. Only bronchography shows the true situation, and without it often a cardiac lobe or another accessory lobe is assumed, while such lobes in reality are exceedingly rare.

Among the author's 100 children, 10 had shrinkage of one whole lung. Thirty-five of the 90 remaining showed shrinkage of one or several lobes, always the lower lobe and sometimes the lower and the middle lobe. In 11 of these 35 cases, foreign bodies were the cause of the disease.

While foreign bodies are found in the right lung about twice as often as in the left, for obvious anatomical reasons, bronchiectasis of the lower lobe is more frequent on the left side than on the right. This shows that foreign bodies probably are not the main cause of bronchiectasis in general, and suggests that the better expectoration from the right side, for the same anatomical reasons, prevents the stagnation of secretions and the formation of bronchiectasis on that side to a certain extent. Regular follow-up studies by bronchography in cases of bronchiectasis will increase our knowledge of the pathophysiology of this disease and will enable us to pick up the tendency toward progress or regress in the individual case, and thus promote our prognostic and possibly our surgical therapeutic efficiency.

HEINRICH LAMM, M.D.

Fisher, A. M., and Finney, G. G.: Lung Abscess. An Analysis of 88 Cases. *Bull. Johns Hopkins Hosp.*, Balt., 1940, 66: 263.

Lung abscess carries a high mortality and the treatment remains far from satisfactory. A group of 88 patients with lung abscess is analyzed in the present report, with special emphasis on the results obtained with the various types of treatment employed.

Lung abscesses complicating other pulmonary diseases such as lung tumors or tuberculosis are not considered, and no effort is made to separate the cases of pulmonary gangrene from those of abscess, for in the opinion of the authors no clear-cut dividing line exists.

Eighty-three of the 88 patients were adults. The duration of the disease influences the prognosis as indicated by the fact that the duration of the disease in successfully treated patients averaged one and eight-tenths months, while unsuccessfully treated patients had suffered from the disease for an average of three and six-tenths months. Contrary to general belief in connection with the location of lung abscess, in the present series, there were slightly more abscesses located in the upper lobes than in the lower.

The controversy as to whether aspiration or embolism is the first step in abscess production still rages. Experimental and clinical data presented by others are reviewed and discussed in detail, particular reference being given to the work of Cutler, Schleuter and Weidlein, and Crowe. The authors are of the opinion that the most important factor leading to lung abscess is atelectasis, resulting from the plugging of a bronchus either from mucous, aspirated material, or a foreign body. In the authors' series 40 per cent of the lung abscess cases followed pneumonia, 9 per cent followed upper respiratory infections, 15 per cent occurred after tonsillectomy or dental extraction, 13 per cent came on after abdominal or other operations, and the preceding factor was unknown in 10 per cent.

The bacteriology of lung abscess is complicated. Cultures taken from the abscesses directly reveal mainly anaerobes, some strictly anaerobic and others facultatively anaerobic. The authors believe that it is probably necessary to have more than one type of organism present with the production of a symbiotic condition before a lung abscess will develop. The importance of the combination of spirochetes and fusiform bacilli is still a controversial subject. In the present series the organism most commonly found in pus obtained by means of the bronchoscope was the aerobic alpha hemolytic (viridans) streptococcus. From the abscesses themselves anaerobic and facultative anaerobic organisms predominated, and of these 8 were streptococci. Direct smears showed spirochetes and fusiform bacilli in many instances, but were thought to be of secondary importance. A gram-negative bacillus, probably bacillus melaninogenicus, was cultured in a fair percentage of cases.

The symptoms and signs in the present series were rather typical: hemoptysis in 26 per cent, chest pain in 40 per cent, profuse expectoration in 65 per cent, and pulmonary signs in less than half of the cases. A differential diagnosis must rule out pulmonary tuberculosis, carcinoma of the lung or bronchus, bronchiectasis, and empyema. Carcinoma is the most difficult condition to eliminate because frequently an abscess is a complication of carcinoma. Roentgenographic and bronchoscopic studies prove helpful in many cases.

Prophylaxis is of extreme importance in the prevention of lung abscess. This prophylaxis consists of the eradication of nose, throat, and mouth infection, especially before an operation. Patients should be placed in positions favoring drainage of the bronchial tree during and following operations. Large doses of sedatives are to be avoided. Postoperative carbon dioxide and oxygen inhalation should be given to hyperventilate the lungs.

In regard to medical treatment a régime should be followed to build up the patient's resistance. Expectorants and steam inhalants are useful at times. Arsenicals are used (intravenously) only in cases in which spirochetes and fusiform bacilli are found in quantities. The routine use of arsenicals has proved disappointing. Sulfanilamide or sulfapyridine should

be tried early, although it is questionable whether these drugs will influence a fully developed abscess. Postural drainage is of utmost importance when it can be obtained. Phrenic paralysis and pneumothorax are useless, except that the latter treatment may be used in an occasional carefully selected case.

Surgical treatment consists of external drainage of the abscess done preferably in two stages. A rib resection is carried out and the wound packed with gauze for at least forty-eight hours. The abscess cavity is then opened widely with the actual cautery and the cavity packed with gauze. Lobectomy is advised against in most cases because of the poor results. Surgical therapy should be undertaken in from three to five weeks if no definite improvement is observed after that period of medical care.

In the authors' series of cases there is a mortality of 41 per cent. It is believed that more prompt, better co-ordinated treatment will reduce the mortality in lung abscess. LUTHER H. WOLFF, M.D.

Kagan, M. I.: The Operative Evaluation of Therapeutic Measures, and Their Remote Results in Empyema of the Chest in Children. *Vestnik khir.*, 1939, 58: 405.

The following conclusions are based on observations of 540 cases of suppurative pleurisy in children under thirteen years of age.

Empyema of the chest in children is a grave condition with a high percentage of mortality and is particularly serious in infants and children under three years of age. Diplococci are the bacteria most frequently responsible for empyema in children. In such cases the course of the disease is milder than in conditions caused by streptococci, staphylococci, or mixed infections. Paracentesis and roentgenograms are suggested as a means of early recognition of an empyema.

The type of bacteria responsible for the condition, and also the age of the patient are the guides in selecting the proper operative procedure. If diplococci can be demonstrated, repeated aspirations are recommended, but if they do not yield satisfactory results, a closed thoracotomy without a rib resection should be performed not later than three or four weeks after the onset of the condition. If, however, the patient is an infant and diplococci are present, the treatment should be limited to repeated aspirations. Streptococcic, staphylococcic, and mixed infections demand a closed thoracotomy without a rib resection, after preliminary aspirations of the pus. An open thoracotomy with or without rib resection should not be performed in children unless a putrid infection of the pleura is present.

The siphon-drainage method of closed thoracotomy is preferable to other methods.

Irrigation of the pleural cavity with antiseptic solutions does not offer any particular advantages and in view of occasional complications is not recommended by the author. JOSEPH K. NARAT, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Quigley, T. B.: Inguinal Herniorrhaphy in the Aged. *New England J. Med.*, 1940, 222: 666.

One hundred consecutive cases of inguinal herniorrhaphy were studied from the records of the Peter Bent Brigham Hospital, in which operation for inguinal hernia was carried out in patients over the age of sixty-five. Ninety-six patients were men and 4 were women; 134 hernias were repaired in 110 operations through 130 incisions. There were almost exactly the same number of right and left hernias. The proportion of indirect to direct hernias was approximately two to one. Eight cases were recurrences after previous operations. In 30 cases there were bilateral hernias. Four sliding hernias occurred in the series. There was 1 operative death, which was due to pulmonary embolism.

In 10 cases operation was imperative, for incarceration in 7 and for strangulation in 3. All the patients recovered; only 3 developed complications.

Nearly three times as many wound complications and recurrences occurred when catgut was used as when fine silk was employed. The same incidence of complications followed the repair of multiple hernias in stages as in single operations.

Novocaine nerve-block anesthesia was followed by the lowest incidence of postoperative complications. The Bassini type of operation was the most satisfactory from the point of view of recurrence. There was no correlation between the incidence of complications or recurrence and the operating time, the experience of the surgeon, concomitant disease, and the age, weight, or blood pressure of the patient.

Inguinal herniorrhaphy, whether elective or imperative, is a safe and satisfactory procedure for the aged patient when carried out under novocaine nerve-block anesthesia, with the minimum of preoperative medication and with fine silk as the suture material. CHARLES BARON, M.D.

Arnold, L. E.: Pneumococcic Peritonitis. *Surgery*, 1940, 7: 555.

The present status of pneumococcic peritonitis is reviewed and a typical case presented. This case was carefully followed both from a clinical and a laboratory point of view. The Type V pneumococcus was first found in the vaginal exudate during the existence of an acute generalized peritonitis. This organism was then found in the sputum, blood, and later in the abdominal and pleural exudates.

There was employed in this case a new type of treatment, which had previously been used successfully in several cases of bacteriemia by Crocker, Valentine, and Brody. A suitable donor was given 100,000,000 killed typhoid bacilli intravenously and 50,000,000 were injected one hour later. At the end of seven hours his sublingual temperature was 104.2° F., and his blood revealed 40,000 leucocytes per c.mm. At this time 300 c.cm. of blood were withdrawn and injected into the patient with pneumococcic peritonitis. Within twenty-four hours there was a dramatic response and the patient roused from her moribund state. Two more of these immunotransfusions were given at forty-eight hour intervals. Following these transfusions, the patient was then operated upon and a large quantity of thick purulent exudate was evacuated from the abdominal cavity. A left empyema was also drained a short time later. Recovery was complete.

It is earnestly believed that this treatment by controlled non-specific immunotransfusions was solely responsible for the recovery of this patient. She not only failed to improve under prontylin and specific serotherapy, but her condition became worse during their use. SAMUEL H. KLEIN, M.D.

Joffe, I. L.: The Surgical Anatomy of the Arterial Blood Supply to the Small and Large Intestines. *Vestnik khir.*, 1939, 58: 338.

In 68 cases the author used Hauch's method of roentgenography of the intestinal arteries after an injection of radiopaque substances.

The intestinal tract receives its blood supply from so-called parallel or marginal arteries located in the mesentery. So-called vasa recta branch out at right angles from these structures and enter the intestinal wall. In the small intestine numerous ramifications of the vasa recta are observed, and they form anastomoses with branches of the adjoining vasa recta. On the other hand, in the walls of the large intestine such anastomoses are minimal as to their size and number.

Injury to an arteria recta may occur in the course of an intestinal resection and, as a result, the blood supply of the corresponding triangular zone suffers. In order to secure an end-to-end anastomosis, it is advisable to place sutures not through this dangerous area but through adjoining regions of the intestinal wall. If the section of the intestines is made at an angle of about 45 degrees, the aforementioned triangles with impaired blood supply are removed with the resected segment; therefore this type of resection of the small intestines is recommended by the author. On the other hand, the peculiarities of distribution of the blood vessels in the walls of the large intestine suggest a perpendicular section.

Appendices epiploicæ receive their blood supply from vasa recta and therefore the removal of such formations may be followed by injury to the artery, with a resulting disturbance of nutrition of the corresponding segment of large intestine. It follows that if an appendix epiploica cannot be preserved, the corresponding portion of the intestine should be slightly inverted at its site. The danger of impair-

ment of the circulation in the wall of the large intestine after the removal of an appendix epiploica is considerable, in view of the fact that the vasa recta frequently form loops in these structures. It has been suggested that the vitality of the large intestine may be tested after a ligation of the mesocolon by removing the corresponding appendix epiploica and watching for bleeding from the stump. The author is opposed to this test in view of the aforementioned danger arising from ligation of a loop of the vasa recta when the appendix epiploica is removed.

JOSEPH K. NARAT, M.D.

GASTRO-INTESTINAL TRACT

Kornblum, K., and Fisher, L. C.: Carcinoma as a Complication of Achalasia of the Cardia. *Am. J. Roentgenol.*, 1940, 43: 364.

"Achalasia," meaning "absence of relaxation," refers to those lesions of the esophagus in which there is dilatation and hypertrophy with no evidence of obstruction distal to the dilatation. The authors of this article tend to the view of Hurst that the abdominal esophagus and that part of the esophagus a short distance above the diaphragm is a true sphincter which, for some reason, fails to relax during the act of swallowing. Numerous theories have been advanced to account for this fact with a good deal of attention having been directed to lesions of Auerbach's plexus of nerves surrounding the structure.

In general, the complication of carcinoma of the esophagus has not been greatly stressed by other writers but the author has noted 2 such complications. The fact that in the advanced condition there is a considerable amount of food and liquid retained in the esophagus, until the hydrostatic pressure causes it to be pushed through into the stomach, gives an excellent opportunity for irritative processes to take place. Exactly this thing happens and the mucosa is often found to be very red and inflamed. Occasionally, nearly all the mucous membrane is ulcerated away, but generally there are islands of tissue which hypertrophy and could easily be the seat of an early malignancy.

The history is usually that of increasing difficulty in swallowing over a period of years, although occasionally the onset is quite abrupt. Dysphagia is intermittent at first but subsequently becomes more or less constant. While this is the outstanding symptom there are others which serve to produce a definite clinical picture. Regurgitation is a fairly common one. Vomiting does not occur and there is no nausea or retching. The regurgitated material contains unchanged food and mucus, but no free hydrochloric acid. Other symptoms include substernal pain, respiratory symptoms, such as cough and dyspnea, and excessive salivation.

The diagnosis should be established by x-ray examinations, passage of bougies, and direct examination with the esophagoscope. Roentgenologically, the typical case offers no difficulties. There is first an obvious obstruction of the lower end of the esophagus, with marked dilatation of the thoracic esophagus unlike that seen in any other condition. The lower esophagus presents a smooth funnel-shaped contour which at times may be angulated but does not present the irregular filling defect seen in cancer. When the condition is marked the esophagus may become tortuous and bulge forward and to the right beyond the cardiac shadow. Frequently the contents will not pass into the stomach until a column high enough to overcome resistance at the cardia is obtained. In the lower part of the chest, just above the diaphragm, there will be noted a triangular shadow with the apex pointed upward. This is due to the shadow of the dilated fluid-filled esophagus superimposed on the cardiac shadow.

In particular, the author most strongly urges that each case be esophagoscoped in order that an accurate diagnosis be made. He believes that in no other way is this possible. He cites several cases, in one of which the x-ray diagnosis was that of achalasia but examination with the esophagoscope showed a neoplasm to be present. In 2 other cases neoplasms developed in typical cases of achalasia after a period of several years. These 3 cases illustrate the necessity for study with the esophagoscope.

JOHN WILTSIE EPTON, M.D.

Novikov, G. M.: Novocaine Bloc in Acute Intestinal Obstruction. *Vestnik khir.*, 1939, 58: 506.

The author considers a novocaine bloc as the most important conservative measure in the treatment of acute intestinal obstruction. Approximately one-third of all patients with this condition do not require an operation and among them those with a dynamic ileus form the majority. A disturbance of innervation of the digestive tract is responsible for the dynamic type of ileus and therefore spinal anesthesia seems to be indicated from the pathogenic point of view. Nevertheless, the author is strongly opposed to this type of anesthesia in view of the possibility of grave complications. He prefers a novocaine bloc, which in all probability has an effect on the autonomic nervous system similar to that of spinal anesthesia.

Among 139 patients with acute intestinal obstruction, 63 were operated upon while 76 recovered after the conservative treatment. Even if a surgical procedure is required, conservative treatment is worth while trying before the operation if the time and condition of the patient allow. If there are no signs of peritonitis and the general condition of the patient allows expectant treatment, the patient is brought to the operating room, where a right or left lumbar novocaine bloc is performed. With regard to the age and weight of the patient, from 50 to 100 c. cm. of a ¼ per cent solution of novocaine are introduced.

In 46 patients the occlusion disappeared after the employment of the novocaine bloc alone. Abdominal pains usually subside after from twenty to sixty minutes, flatus is passed, the abdomen becomes soft, and palpation is painless; finally, a defecation takes place and the patient falls asleep.

In 3 patients the novocaine bloc failed, while an enema followed by siphoning of the introduced fluid removed the occlusion. In some cases pains subsided but flatus was not passed. In 22 of such cases an enema was employed with success. The author is convinced that the enema alone would not have produced this effect.

If within one hour after the novocaine bloc the obstruction does not disappear and the enema also fails, a diagnosis of mechanical occlusion is made and an operation performed.

Apparently the novocaine bloc acts on the spastic as well as on the paralytic ileus. This paradoxical fact is in agreement with experimental findings pointing to the amphotropic character of various substances which may act on the sympathetic as well as on the parasympathetic system.

The unusually high percentage of recoveries after the conservative treatment, viz. 55 per cent, suggests the possibility of the efficiency of the novocaine bloc in the early stages of mechanical obstruction. Not only can a mechanical obstruction be replaced by a dynamic ileus but, conversely, a dynamic obstruction may be replaced by the mechanical type. Probably the initial irritation leads to a dyscinesia of the intestinal tract, followed by a dynamic and later by a mechanical ileus. Novocaine bloc is able to remove edemas of inflammatory, toxic, or traumatic origin and this action is probably responsible for the not infrequent effect of this type of anesthesia on mechanical obstruction.

JOSEPH K. NARAT, M.D.

Kross, I., and Schiff, F.: Pseudosurgical Syndromes Produced by Salmonella Organisms. *Am. J. Digest. Dis.*, 1940, 7: 176.

Sporadic cases of infection from the salmonella group of bacteria may simulate the clinical picture of acute intra-abdominal surgical infection so that surgical intervention may be carried out on a mistaken diagnosis. The danger of such a mistake lies in the fact that the individual so infected may be a source of infection which may result in an epidemic of the disease.

Two cases are reported in detail. One case was that of a twenty-six-year-old man who had symptoms which included generalized abdominal pain most severe in the periumbilical region, vomiting, and loose bowel movements. There was definite tenderness and rebound tenderness in the lower abdomen. Three days after the onset a laparotomy was performed under the impression that the condition was acute appendicitis. At operation there was free clear yellow fluid in the peritoneal cavity, and moderate inflammation of the serosa of the ileum was observed. The appendix showed no inflammation. Postoperatively, examination of the feces showed salmonella typhimurium. Specific agglutinins were found, which confirmed the diagnosis.

The second case reported was that of a fifty-five-year-old white woman who was admitted with a history of abdominal pain, mostly localized to the periumbilical region and to the right lower quadrant. The onset of the condition was accompanied by fever of 103° and a chill, and vomiting occurred on 4 occasions. Physical examination revealed an acutely ill white woman, her most marked abdominal finding being extreme tenderness on the right side. The abdominal signs became localized in the right upper quadrant. The patient was prepared for operation in the surgical ward with the diagnosis of acute cholecystitis or acute appendicitis, but, because of the development of an apparent bronchopneumonia, operation was delayed, and on investigation of the patient's stool a positive culture for salmonella, paratyphoid C group, was found. This organism was also isolated from the duodenal drainage. The bacteria were identified as salmonella morbificans bovis, this being the first time that infection by this organism has been reported in the Western hemisphere, so far as is known.

It is advisable for the clinician and especially for the surgeon to pay attention to salmonella infections, according to the authors. By doing so an unnecessary laparotomy which may endanger the patient may be avoided.

LUTHER H. WOLFF, M.D.

Masciottra, R. L.: Primary Carcinoma of the Duodenal Bulb (Carcinoma primitivo del bulbo duodenal). *Rev. méd.-quirúrg. de patol. femenina*, 1940, 15: 178.

Masciottra states that primary carcinoma of the first portion of the duodenum is extremely rare. He reports a case in a woman, aged fifty-four years, who began to have vague disturbances ten years previously and whose condition became rapidly worse during the past four months. The tumor was removed and the histological diagnosis was adenocarcinoma. The patient died twenty-four hours after the operation.

Primary carcinoma of the duodenal bulb constitutes a well defined anatomical and clinical entity among the epithelial neoplasms of the duodenum, which are divided into those of the duodenum proper and those of the ampulla of Vater: the former are subdivided into supra-ampullar and infra-ampullar tumors. Various theories have been offered to explain the origin of duodenal cancer: development in an aberrant island of gastric mucosa or pancreatic tissue, in an old diverticulum of the duodenum, in a duodenal ulcer, or in Brunner's glands.

The tumor is nearly always diffuse, annular, more or less stenosing, and infiltrating. Histologically, it is an adenocarcinoma or an alveolar carcinoma. Various degenerations may occur, colloid degeneration being the most frequent: cystic cavities with a gelatine-like mucoid content are not infrequently found in the tumoral mass. The participation of the stroma in the tumor varies. The tumor nearly always contracts adhesions with the neighboring organs, particularly the pancreas and the gall bladder. Metastasis seems to be frequent, especially to the liver.

The clinical picture of carcinoma of the first portion of the duodenum is not characteristic and this explains the frequent errors in diagnosis. There are general symptoms, such as loss of weight and strength, anorexia, flatulent dyspepsia, and anemia. Pain in the right hypochondrium two or three hours after meals, accompanied or not by nausea and vomiting, occurs some time or other, and subicterus may be present. Hematemesis and melena are very rare. A choledochus syndrome appears in cases of compression of the biliary tract. At times, the disease starts suddenly with great epigastric pain and symptoms recalling obstruction of the pylorus. Clinical examination offers nothing characteristic, but a tumor may be found in some cases on palpation, usually when the neoplasm has already invaded neighboring organs and contracted adhesions. Ascites is rarely present. Laboratory examinations offer no sure elements for the diagnosis. Theoretically, duodenal sounding may be of value; practically, it is not. The same applies to roentgen examination: in advanced cases, the most frequent diagnosis is that of antropyloric tumor. In short, the diagnostic difficulties are such as to make an operative diagnosis difficult or impossible.

Surgery is the only treatment to be considered. Unfortunately, many cases come to operation in the advanced stage and the immediate mortality is consequently high; in addition, recurrences are frequent within four or six months. In cases favorable from the surgical point of view, ample gastroduodenal resection may give good immediate and late results.

RICHARD KEMEL, M.D.

Sorce, G.: The Morphology and Functional Capacity of the Gall Bladder in Acute Appendicitis (Morfologia e funzionalità della colecisti nell' appendicite acuta). *Arch. ital. di chir.*, 1939, 57: 392.

Sorce recalls that a physiological or pathological stimulation in a certain part of the body may cause a reflex reaction in some other distant part and that this reaction may be of sensitive, sensorial, motor, or secretory nature. In abdominal pathology, a lesion localized in one of the visceral organs may determine notable functional changes in other segments of the digestive apparatus. The author has made a study of the morphology and the functional capacity of the gall bladder in acute appendicitis by means of cholecystography and Bronner's test in 21 patients immediately after the attack of appendicitis or during the period of remission; none of these patients had previously suffered from any hepatobiliary disorder.

The results of cholecystography were completely negative in 3 cases and absolutely normal in another 3. As to the remaining cases, there was retardation of the injection of the gall bladder with a pale atonic shadow in some, even when the rapid method of Antonucci was used, and simply a pale atonic shadow in others; in 1 case the shadow was small, atonic, and displaced medially. Bronner's test revealed more or less retardation of the elimination in 5 cases. Seven of the patients were submitted to laparotomy and systematic exploration of the abdominal organs, and especially of the biliary tract. In 4 the gall bladder showed signs of recent changes; these consisted of thickening and vascular injection of the vesicular serosa and, in 2 cases, of well vascularized and easily detachable adhesions between some part of the gall bladder and other organs, the epiploon and a loop of the small intestine in 1 case each. In the other 3 the gall bladder did not show any macroscopic changes (1 with congenital alterations).

The fact that injection of the gall bladder may not occur in cholecystography because of the presence of a disease in other organs has been reported by some American authors, who have mentioned gastric or duodenal ulcer, gastric carcinoma, renal sclerosis, pyelitis, cystitis, Basedow's disease, and diabetes. At present, no explanation can be offered for this phenomenon. As to the other cases, severe changes of the mucosa may give an intense shadow, but a pale shadow as well as other signs of dysfunction, such as retardation of the injection, atonic gall bladder with vague contour, and retardation of evacuation, are not solely the expression of the anatomical condition of the organ; other factors must play an important part in the course of the test and it is evident that the effects of the nervous correlation between the gall bladder and other parts of the digestive tract will vary from case to case and depend on the intensity of the stimulation and the basic tone of the sympathetic nervous system. The presence of inflammatory changes in the gall bladder, found at operation and coinciding with acute appendicitis, shows that the morphological and functional changes of the organ must be caused by its participation in the inflammation of the appendix, even if this participation is only of slight degree. Besides, numerous observations of associated appendicitis and cholecystitis have been published.

On the basis of his own studies and of those of others, the author thinks that the disturbances noted must be attributed to the initial inflammation of the biliary tract even in cases in which no macroscopic lesions of the gall bladder are found at operation.

RICHARD KEMEL, M.D.

Iesu, G.: The Gall-Bladder Syndrome on the Basis of Subacute Recurrent Appendicitis in the Presence of an Ectopic, Subhepatic Cecum (Sindrome colecistitica da appendicite subacuta ricorrente, con distopia cecale sottoepatica). *Riv. di chir.*, 1939, 5: 436.

The author reports a case in which the ileocolic loop was fixed in the right upper quadrant and associated with inversion of the cecum. The patient, a woman of forty-eight years and a native of Naples, complained of right hypochondriac pain occurring one-half hour after meals and accompanied by fever of remittent character. Analgesics failed to relieve the pain which radiated to the right arm and shoulder and was elicited by the ingestion even of

liquids. The past history was uneventful and the patient gave no history of constipation.

Physical examination revealed a rather poorly nourished individual who manifested a subicteric tint and pallor of the mucous membranes. Marked tenderness was noted over the gall bladder, where a small tumor mass was felt. The abdomen was otherwise not remarkable; Rovsing's sign was absent. Visualization of the gall bladder was normal and no stones were seen.

While in the hospital, the patient underwent another attack of right upper quadrant pain, with elevation of the temperature and retching. A laparotomy was performed on the following day, and the terminal loop of the ileum was found to be adherent for a distance of from 8 to 10 cm. to the posterior wall of the peritoneal cavity and to join the cecum from above downward after describing a circle. The cecum, too, was adherent to the parietal wall and became continuous with the ascending colon in such a way as to form a horseshoe, with the concavity facing superiorly. The appendix was approximately 10 cm. in length and gave evidence of a subacute inflammatory process. It descended tortuously and was separated from the gall bladder by a small piece of omentum which served to establish a cholecystoappendical adhesion. The gall bladder and ducts were otherwise normal. Simple appendectomy was performed, with complete relief of the symptoms.

The author analyzes displacements of the cecum and terminal ileum according to the work of Alglave in 1907 who found the ileocolic loop to be situated in the lumbar fossa in 3 cases, in the iliac fossa in 74 cases, and in the pelvis in 23 cases, all possible modifications of the length of the mesentery being present. Although it was impossible to exclude an acquired displacement in which an abnormally mobile ascending colon was dragged superiorly and fixed secondarily by inflammation, it seemed more probable that the anomaly was congenital. The clinical picture produced by this entity is not well defined, and is characterized by obstinate constipation, attacks of right upper-quadrant pain with a sense of pressure in the epigastrium and right flank, and various dyspeptic symptoms. These symptoms, however, are by no means invariable, and the differential diagnosis is manifestly difficult. Therapy ordinarily consists of simple appendectomy; interference in the anomalous structures is not recommended. EDITH FARNSWORTH, M.D.

Mayo, C. W., and Miller, J. M.: The Surgical Treatment of Sigmoidovesical Fistulas. *Arch. Surg.*, 1940, 40: 897.

Diverticulitis with perforation is perhaps the leading etiological factor in the production of sigmoidovesical fistula. The formation of this type of fistula is an extremely serious complication in patients with diverticulitis or other inflammatory conditions, and the mortality from one-stage surgical procedures for the correction of the fistula due to diverticulitis is excessive.

Keeping the facts learned from other surgical procedures on the bowel in mind, multiple-stage operations are most satisfactory in dealing with this particular type of fistula. Colostomy which obviates spilling from the upper into the lower part of the colon is usually the first stage, and it should be performed as close to the fistula as practicable in order to avoid redundant bowel above the vesicocolonic tract. A sufficient interval should be permitted to elapse after preliminary colostomy to allow spontaneous healing of the fistula, if it will occur. If it occurs the colonic stoma should not be closed until one is positive that the inflammation in the sigmoid has completely subsided, else there will be a recurrence.

When carcinomatous invasion from the sigmoid colon into the bladder has occurred and a sigmoidovesical fistula has formed, the prognosis is extremely poor. Ascending infections of the urinary tract are not very common complications of vesicosigmoidal fistula.

Crowell, E. A., and Dulin, J. W.: Congenital Anomalies of the Anus and Rectum. *Surgery*, 1940, 7: 529.

Congenital malformations of the anus and rectum occur about once in every 10,000 births. Most of these are due to arrests or abnormalities of development arising in the seventh or eighth week of embryonic life. At the University of Iowa Hospitals during the past twelve years there have been 28 cases of anorectal anomalies, an incidence of 1 in 5,300 admissions. All of the cases may be grouped into five types:

Type 1. Incomplete rupture of the anal membrane or stenosis at a point from 1 to 4 cm. above the anus; 3 cases (2 male, 1 female).

Type 2. Membranous imperforate anus; 6 cases (5 male, 1 female).

Type 3. Imperforate anus with rectal pouch separated from it; 16 cases (8 male, 8 female).

Type 4. Normal anus and anal pouch, rectal pouch ending blindly; 1 male.

Type 5. Partial or complete absence of the anal sphincter; 2 females.

In 17 instances fistulas were present between the rectum and the genito-urinary system or perineum.

In 13 cases associated congenital malformations were present, the most frequent being congenital club-foot and deformities of the hand.

In 4 cases restoration of normal function to the anus and rectum was accomplished. In 13 cases obstruction was overcome but some anal or rectal dysfunction remained. In 10 cases no improvement occurred and in 1 instance the end-result is not known.

Twenty-three cases were treated surgically with 4 operative deaths. Two patients died subsequently, one from congenital heart disease and the other from intestinal obstruction. In this group a satisfactory result was obtained in more than 65 per cent of the cases.

The method of treatment varies according to the type of anomaly. When an associated fistula sufficient in size to allow passage of the fecal stream is present, the condition may not be recognized until regional examination is made.

Relief of the obstruction is the most important part of the treatment. In the debilitated infant with a high-lying rectal pouch the performance of a double-barreled colostomy is the safest procedure. In such circumstances the colostomy is not only life-saving but is of value in allowing subsequent visualization of the distal, blind loop of bowel. Primary colostomy is always indicated when a rectovesical fistula is present. At a later date, when the patient's general condition is satisfactory and the anatomical structures are more fully developed, plastic procedures may be performed. It is desirable to delay complicated reconstructive procedures until the patient is eight or ten years of age. Even after long periods of non-use, proper utilization of the anal sphincters usually results in satisfactory bowel control. Many fistulous tracts will close spontaneously after a satisfactory proctoplasty or colostomy. The complete relief of bowel obstruction is a prerequisite for the successful operative closure of a fistula. An adequate fistulous opening without incontinence is better than a malfunctioning, normally located anus. MANUEL E. LICHTENSTEIN, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Varela Chilese, R.: The Problem of Residual Lithiasis of the Common Duct (El problema de la litiasis residual del colédoco). *Rev. méd.-quirúrg. de patol. femenina*, 1940, 15: 112.

The problem of residual lithiasis of the common duct is a very important one because the best statistics show it to occur in almost 15 per cent of the operations on the biliary system, and some surgeons report 30 or more per cent.

The causes of this condition are: (a) the failure of extraction of a stone placed very high in the biliary tree which later on migrates to the common duct; (b) the impossibility of ascertaining the existence of a stone because of a lack of manual or instrumental exploration or a defect in the radiological exploration; (c) the necessity of shortening the operative procedure in urgent cases or in serious chronic conditions; and (d) the possible migration of small stones through a dilated cystic duct produced by the exploration and evacuation of the common duct.

The author believes that the best prophylactic measures are a careful and thorough operative exploration of the biliary duct and its rami so as not to overlook any stone, which can later be the origin of a so-called residual lithiasis of the common duct.

The exploration can be made by means of supraduodenal choledochotomy, a manual and instrumental exploration of the biliary duct, an injection of fluids into the choledochus, a dilatation of the sphincter of Oddi, or a papillotomy.

The author recommends the ligation of the cystic duct previous to the choledochotomy as a prevention against the migration of a cystic stone. The operative cholangiography, proposed by Mirizzi, has been accepted by many surgeons, and is one of the most effective methods to overcome the difficulties of the exploration; however, it requires a radiological operative table, which is not always found in every operating room.

Diagnosis is a postoperative problem and it can be made in two conditions: when the common duct is drained by a Kehr's catheter or when there is no drainage.

If a catheter is available the diagnosis is easier:

1. The occlusion of the T catheter brings pain in the right hypochondrium and fever, and if one insists discoloration of the feces, jaundice, and negative duodenal catheterization.

2. Velasco Suarez places a colored fluid into the catheter (1 per cent solution of mercurochrome); the fluid must pass into the duodenum in from thirty to sixty seconds and any delay can be taken as a sign of the existence of mechanical obstruction.

3. Walters, Butsch, and Gowans have studied the canalicular pressure (normal: 0 to 6 cm. of water).

4. The postoperative cholangiography is very valuable in determining if the patient must or must not be re-operated upon.

In case there is no Kehr's catheter in the common duct, one must consider the following conditions:

1. The persistence of a biliary fistula with or without acholia and with negative duodenal soundings.

2. Attacks of pain, fever, and jaundice coinciding with an interruption of the external biliary flow.

3. The radiological study of the fistula injecting a contrast medium through a Nelaton's catheter introduced in the fistula.

There are many procedures for the treatment of this condition. They can be medical or surgical.

The medical means are:

1. Solvents of the stones, like ether.

2. The mechanical action of large transcholedochus washings with saline solution.

3. The lubrication with vaseline or paraffine oil, which facilitates the descent of the stones.

4. The aspirative action of the duodenal catheterization.

5. The antispasmodics like nitroglycerine, atropine, acetylcholine.

The mixed procedures, as advocated by Pribram, consist of the injection into the common duct of an ether-paraffine mixture which combines the dissolving and the lubricating action.

The author thinks that, if after from forty to sixty days of medical treatment there seems to be no progress in the state of the patient, one can decide upon an operation. The failures of medical treatment are not to be considered contraindications to its use, because even one successful result is enough to keep it as a valuable means of relieving this difficult situation.

Referring to the surgical treatment the author follows the technique of Bengolea, which, briefly, consists in: spinal anesthesia with more or less than 4 mgm. of percaine. An incision from 5 to 8 cm. long is made on the operative scar, with its middle part on the opening of the fistula. Following the T catheter the different sheets of the abdominal wall are set apart. The common duct appears to be very near to the wall and it is very easy to reach the opening of the choledochotomy following the tube. Once reached the catheter is extracted, and the stones, which have been previously localized by the cholangiography, are taken out. Once the permeability of the duct is re-established, the surgeon can close the choledochotomy or drain it again.

HECTOR MARINO, M.D.

Loi, W.: Suppurative Pancreatitis (Sulla pancreatite suppurativa). *Settimana med.*, 1940, 28: 109.

Loi describes 2 fatal cases of suppurative pancreatitis. The first was found in a man, aged thirty-two years, who had suffered from dyspeptic disturbances for the past five years. These disturbances were accompanied by fever and recurred at long intervals under the form of short attacks. One year before death, symptoms of biliary obstruction and infection occurred and the presence of a tumoral mass was discovered in the mesogastrium shortly before death. Necropsy revealed two large peripancreatic and pancreatic abscesses, chronic interstitial pancreatitis, compression of the choledochus and of Wirsung's duct, angiocholitis, and splenic tumor.

The second case was that of a woman, aged forty-four years, who had previously undergone a choledochotomy and a cholecystoduodenostomy and presented intense icterus: a roentgen diagnosis of tumor of the head of the pancreas had been made. Necropsy revealed scirrhous cancer of the pancreatic head with involvement of the vaterian region and phlegmonous pancreatitis.

The author finds the classifications of pancreatitis given by various writers inadequate and proposes the following morphological classification:

I. Acute pancreatitis
   - A. Simple (parenchymatous, interstitial, and mixed)
   - B. Purulent (with small multiple foci, with large foci, phlegmonous, gangrenous, with steatonecrosis)
   - C. Necrotizing hemorrhagic

II. Chronic pancreatitis
   - A. Primary sclero-atrophic (circumscribed and diffuse)
   - B. Lithiasic sclero-atrophic
   - C. Sclerohyperplastic (circumscribed and diffuse)

To this general schema could be added the elements derived from the histological examination which would show various types of chronic pancreatitis, which depend on the prevailing distribution of the connective tissue: perilobular, intralobular, acinous, periinsular, and insular.

Suppurative pancreatitis is caused by the ordinary pyogenous bacteria or by other pathogenic bacteria which may assume pyogenous characters. The bacteria may reach the pancreas by the ascending canalicular, the circulatory, or the lymphatic route, or by direct inoculation. It is easy in many cases to determine the route by which the bacteria have attacked the pancreas; in others, it is obscure. Various factors prepare the pancreatic terrain for the invasion of the bacteria: excessive and incongruous feeding, obesity, syphilis, tuberculosis, and, especially, biliary lithiasis and intestinal worms. The route most commonly taken by the bacteria is the ascending canalicular, and the conditions which most frequently favor the access of the bacteria to the pancreas are, besides biliary and pancreatic lithiasis, the tumors or the inflammatory processes developing in the organ or around its ducts. Therefore, the abscesses are usually found in the head of the pancreas and less frequently in the body or the tail, and, hence, we have Dejardins' "triangle of infection," the base of which lies between the major and minor caruncles, while the apex reaches the junction of the ducts of Wirsung and Santorini.

From the symptomatological point of view, suppurative pancreatitis presents hyperacute, acute, subacute, and chronic forms, and its course is related to the complications which may accompany the primary form. It is difficult to make the diagnosis with certainty, and the prognosis is always serious. The treatment must always be surgical.

RICHARD KEMEL, M.D.

Milhiet, Dormay, and Feyel: Cancer of the Body of the Pancreas of Tumoral Form, Treated by Subtotal Pancreatectomy (Cancer du corps du pancréas à forme tumorale, traité par pancréatectomie subtotale). *Mém. l'Acad. de chir.*, Par., 1940, 66: 5.

Milhiet, Dormay, and Feyel report a case of cancer of the pancreas of an unusual type in that the growth was a tumor implanted on the pancreas rather than infiltrating the organ. They find only 4 other cases of this type reported in the literature. In their case the patient was a woman, thirty-two years of age when she first came under observation; at that time symptoms of epigastric pain and frequent vomiting had been present for about a year, and she had lost weight rapidly. She was under observation for three years, during which time the symptoms subsided to a considerable degree for about a year. Operation was not done until the symptoms became increasingly severe (three years after the first examination). At operation a large tumor was found which was implanted on the pancreas at the junction of the body and the tail. A subtotal pancreatectomy was done (including the tumor and the body and the tail of the organ), and only a stump of the pancreas was left. The patient showed definite improvement for a period of two months after operation; she then became cachectic and died.

Pre-operative roentgenological study in this case showed a compression of the vertical portion of the stomach, which formed a narrow lumen between two cavities (bilocular stomach). There was no ulcer niche or defect in the gastric outline, and the gastric mucosa appeared to be normal. It was evident from the roentgenogram that the obstruction of the lumen was caused by pressure from without. This form of gastric obstruction by a pancreatic tumor is unusual, although obstruction of the pylorus or the duodenum by pressure of a pancreatic tumor is commonly observed. Another point of interest in this case was the long course of the disease, as cancer of the pancreas usually advances much more rapidly. From the histological standpoint the tumor was an epithelioma of atypical structure, but evidently of glandular origin.

A review of the literature shows that subtotal pancreatectomy has been done in a few cases, with good immediate results. In some cases cancer of the pancreas causes but a few symptoms at onset, but in the case reported the symptoms observed three or four years before operation was performed might have been considered an indication for operation. The possibility of pancreatic involvement should be considered in patients with symptoms of dyspepsia and an unusually rapid loss of weight.

ALICE M. MEYERS.

MISCELLANEOUS

Storck, A. H.: Penetrating Wounds of the Abdomen. *Ann. Surg.*, 1940, 111: 775.

The author reviews 46 personally managed cases of penetrating wounds of the abdomen, 35 of which were gunshot wounds, and 11 stab wounds. From this report, he concludes the following:

Facilities for quick transportation, arrangements to shorten the pre-operative duration of the injuries, and provisions for promptly combating shock and hemorrhage are important in the management of penetrating wounds of the abdomen.

The symptoms associated with penetrating wounds of the abdomen are frequently indefinite. Pain is frequently slight or absent. Penetrating wounds of the abdomen which occur via the gluteal, sacral, or perineal regions are particularly likely to be overlooked because of the frequent absence of early symptoms. Physical findings in penetrating wounds of the abdomen may be misleading. Tenderness and rigidity are not constantly present. Examination of the urine for gross or microscopic blood should be made in order to reveal or confirm the presence of injuries of the urinary tract. Red-blood-cell counts and hemoglobin determinations may be misleading or late indicators of hemorrhage. Roentgenological examination is often of value and assistance in the pre-operative determination of probable injuries.

The recognition of associated injuries, particularly those of the chest, is important in the management of penetrating wounds of the abdomen. The study of wounds of entrance and exit may indicate whether or not penetration of the abdomen has occurred. When there is uncertainty concerning penetration of the abdomen, exploratory celiotomy usually should be performed. Even when the wounds have been produced by small-sized shot, abdominal exploration should be performed.

A short interval between the time of injury and the time of operation usually is favorable in its influence on the outcome, but operations should be delayed until patients have at least recovered considerably from shock. In penetrating wounds of the upper abdomen, operation may be necessary and is relatively safe during a longer period than in wounds which involve the lower portions of the abdomen. Prolonged shock produces irreversible deleterious effects; therefore, attempts should be made to rapidly combat shock and hemorrhage. The extent of hemorrhage largely determines the outcome in penetrating wounds of the abdomen. In the presence of considerable hemorrhage, transfusions during and shortly after operation, and totaling as much as 3,000 c.cm. of blood, may be necessary. Transfusion registries and blood banks are important in making available adequate supplies of blood. Transfusions of blood should, whenever possible, displace the administration of saline or glucose infusions or stimulant drugs.

Spinal anesthesia may be employed to advantage in selected cases.

The ricochet of bullets, as well as variations in the relative position of parts of the patient's body at the time of injury as compared with the position of the same parts on the operating table, accounts for apparently bizarre courses of bullets. Unexpected and unpredictable visceral injuries which proved to be due to the position of the patient, or the phase of respiration at the time of injury, were frequently observed.

The total number of perforations of either hollow or solid viscera was only slightly less in the group which lived than in the group which died. Whenever perforation of one wall of a hollow viscus is detected the opposite wall of the viscus should be examined for possible injury. The mortality rate was unusually low in the group of cases with injury of the large intestine, probably because of the relatively small amount of spillage which accompanies such injuries. Extraperitoneal hemorrhage or hemorrhage between the leaves of the mesentery is likely to obscure important injuries. Injuries of the gall bladder, bile ducts, pancreas, and kidneys are extremely serious. Perforations of the spleen usually require splenectomy. Lacerations of the liver causing hemorrhage may sometimes be sutured satisfactorily, but in other instances hemorrhage from lacerated surfaces of the liver can best be controlled by means of packs. Unrepaired perforations are frequently discovered at autopsy; therefore, re-examination after all perforations are thought to have been repaired is advisable if the patient's condition warrants such a procedure.

Because of the important relationship between hemorrhage and mortality, attention during operation should be directed first to the arrest of bleeding. Time-consuming procedures, such as intestinal resection, should be avoided whenever possible. Mechanical devices for anastomosis should rarely if ever be used. Enterostomy is usually ineffectual, and has been displaced by better methods of preventing or combating ileus. Drains introduced into the peritoneal cavity are usually unnecessary and undesirable, but drainage of the abdominal wall should be instituted when hollow viscera have been perforated. Silk or cotton sutures and ligatures are superior to catgut for the repair of hollow viscera and for the closure of the abdominal wall. Irrigation or lavage of the peritoneal cavity is usually futile, but it is desirable to suck out or pick out from the peritoneal cavity liquid blood, blood clots, detached particles of viscera, intestinal contents, and foreign bodies.

Postoperative attention should include measures to combat any still-existing shock or effects of hemorrhage. The application of heat to the abdomen, the administration of large doses of morphine, the establishment of gastroduodenal suction drainage, the avoidance of enemas and flushes, and the infusion of glucose and lactated Ringer's solution are effective measures in preventing or reducing the severity of ileus and peritonitis. The Miller-Abbott tube as well as oxygen therapy may be employed to advantage in selected cases. Biological preparations, such as coli-bactragen, and chemotherapeutic agents such as sulfanilamide and sulfapyridine may prove of value in reducing the mortality from peritonitis resulting from penetrating wounds of the abdomen. Desoxycorticosterone acetate, or other preparations containing the adrenal-cortex hormone, may benefit those cases in which peritonitis is anticipated or already exists. Vitamins should be administered parenterally or orally to favor wound healing and to compensate for the general vitamin deficiency which is likely to develop during the postoperative period. Lyophiled serum or whole-blood transfusions are sometimes necessary for the maintenance of plasma protein at a normal level during the postoperative period.

Atelectasis and pneumonia frequently complicate penetrating wounds of the abdomen; and in view of this fact it is important that measures be taken to prevent or promptly treat these pulmonary complications.

The mortality of penetrating wounds of the abdomen is, and will surely continue to be, disappointingly high. In the present series, the mortality in the stab-wound cases was 27.2 per cent; the mortality in the gunshot wound cases was 40 per cent; and the combined mortality was 37 per cent. However, recent advances in the treatment of shock, hemorrhage, ileus, and peritonitis, which is so important in the management of penetrating wounds of the abdomen, are encouraging.

SAMUEL H. KLEIN, M.D.

Cosacesco, A., David, N., and Stanesco, C.: Radiology in Free Intraperitoneal Fluid (Les images radiologiques de liquide libre intrapéritonéal). *Presse méd.*, Par., 1940, 48: 310.

Although much has been written on the value of fluoroscopy in the diagnosis of intestinal obstruction and perforation of the hollow viscera, little has been said about its value in the diagnosis of the amount and position of free intraperitoneal fluid. The authors believe that this is a very useful diagnostic adjunct and that it should be done routinely and without special preparation of the patient.

Six case reports are offered from the radiologist's point of view which confirmed the fluoroscopic diagnosis of two independent collections of free pus in the peritoneal cavity. These required separate incisions in the abdominal wall; 3 cases were of appendicitis, 2 of perforated gastric ulcer, and 1 of strangulated inguinal hernia. The diagnosis in these cases was made on clinical grounds, but the immediate drainage of the two independent collections of fluid or pus averted a long and disappointing convalescence.

Routine fluoroscopic examination in acute abdominal conditions gave much more pertinent results in 2 cases with copious intra-abdominal hemorrhage. Both were cases of ruptured spleen with a large amount of free blood in the abdominal cavity, in the first of which early diagnosis was made possible principally by fluoroscopy. In a patient who had had a high gastric resection and who had an elevated temperature with pleurisy on the sixth postoperative day, there was some doubt as to whether the febrile reaction was due to the lung and pleura or to some peritoneal condition. Fluoroscopy revealed a collection of fluid beneath the mesocolon. ADRIEN VERBRUGGHEN, M.D.

Pozzan, A., and Baccaglini, G.: The Blood Picture in Hemoperitoneum (Sul comportamento della crasi sanguigna nell 'emoperitoneo). *Arch. ital. di chir.*, 1940, 58: 56.

The authors summarize data collected by various investigators of hemoperitoneum, and contribute a series of experiments performed upon dogs. The subjects were divided into three groups: the first, comprising 8 animals in which blood was drawn from the carotid artery in a paraffin-coated syringe and injected immediately into the peritoneal cavity; the second, comprising 2 animals in which the blood was similarly drawn, but injected subcutaneously. In the last group, consisting of 2 animals, the blood was drawn as before but physiological salt solution was injected into the peritoneal cavity. The amount of blood removed varied with the weight of the animal from 150 to 500 c.cm. In order to avoid effects possibly referable to general anesthesia, ethyl chloride was employed locally. Frequent blood counts were made during the first eight days following the procedure.

In addition, data were collected on the clinical course of the condition, temperature, fluid balance,

and uric acid of the blood. In the first group the erythrocyte and hemoglobin values were found to decrease thirty minutes after the operation, and to increase in from three to six hours to values almost approximating the original. This increase, which reached its apex in from twelve to twenty-four hours, was then followed by an erythropenia which lasted for four days or more, the counts then gradually rising to normal. Coincidental with the increase in red cells an increase in fragility was observed which disappeared with the onset of anemia. In the second and third groups, on the contrary, the erythrocyte and hemoglobin values were found to diminish immediately upon operation, the decrease lasting for from thirty-six to forty-eight hours, after which a gradual return to normal was noted. In these groups no discrepancy of the fragility determinations was noted. In contrast to other investigators, the authors found in all groups a leucopenia at thirty minutes followed by a moderate leucocytosis which reached its peak at twenty-four hours and was succeeded by a gradual return to normal.

The clinical condition of the animals treated with blood in the peritoneal cavity was found to be decidedly worse than that of the control groups, and was characterized by elevation of temperature lasting for several days, with moderate albuminuria and the transient presence of casts. At no time was hemoglobinuria noted. A temporary rise in the uric acid of the blood was uniformly observed, which was corroborated by indications of hepatorenal involvement found when autopsy was performed on the two animals of Group I which died as a result of the procedure.

On the basis of these observations the authors deduce that blood injected in the peritoneal cavity is absorbed whole into the general circulation; that erythrocytes so absorbed are rapidly destroyed, as shown by the reaction of the spleen and the reticuloendothelial system of the liver, as well as by the preceding period of increased fragility; and that blood poured into the peritoneal cavity has a deleterious effect upon the general condition.

EDITH FARNSWORTH, M.D.

GYNECOLOGY

UTERUS

Durel, P., Ratner, V., and Deroin, A.: An Attempt at Anatomicoclinical Classification of Cervicitis (Essai de classification anatomo-clinique des cervicites). *Gynéc. et obst.*, 1939–40, 40: 305.

In the classification of chronic cervicitis, Durel and his associates consider that the pathological changes are the most important and primary factor. Most of these pathological changes are indicated by the findings on careful examination with the speculum; they can be confirmed by biopsy. By associating these pathological findings with the clinical findings, an anatomicoclinical classification of cervicitis has been worked out, which the authors present.

A. Congestive cervicitis, in which the clinical symptoms are pain, redness, and edema of the cervix. The biopsy shows the glands hypertrophied and lymphocytic, sometimes polymorphonuclear, and with infiltration between them. This form of cervicitis may be caused by various types of infection, but it is often gonorrheal.

B. Cervicitis characterized by loss of epithelium. This may take the form of cervical erosion or ulceration, but if the latter, the ulceration is small and superficial. Cervical erosion results primarily from obstetrical tears of the cervix; it is of traumatic rather than of infectious origin, but is usually complicated by infection. This type of epithelial lesion is often associated with glandular lesions (Class D).

C. Cervicitis with lesions of the corium predominating. This group includes several sub-groups: ulcerative nodular cervicitis, presenting an appearance like that of ulcerative cervicitis of the previous group with loss of epithelium, associated with numerous nodules; a pseudoneoplastic cervicitis, in which the nodules are large and bleed easily, and in which differentiation from cancer may be difficult even by histological examination; mucous polyps of the cervix; sclerosis of the cervix, hypertrophic or atrophic.

D. Cervicitis with predominance of glandular lesions. This includes the following subgroups; purulent or mucopurulent glandular cervicitis, often chiefly endocervical and not infrequently due to gonorrheal infection; cystic glandular cervicitis due to blocking of the orifices of the infected glands by sclerosis; hyperplastic glandular cervicitis, sometimes described as adenoma of the cervix.

E. Leucoplakia and leucoplakia-like lesions of the cervix. True leucoplakia is difficult to distinguish from lesions that resemble it on clinical examination; this can be done only by biopsy.

F. Complex forms of cervicitis, in which two or more of the forms described are associated.

These various types of cervicitis may be due to different types of infection, puerperal, gonorrheal, and other infections; and they may be complicated by uterine or adnexal involvement, but these are not essential factors in the classification outlined.

ALICE M. MEYERS.

Arnell, R. E., and Potekin, J. S.: Granuloma Inguinale (Granuloma Venereum) of the Cervix. *Am. J. Obst. & Gynec.*, 1940, 39: 626.

Thirty-eight cases of granuloma inguinale of the cervix were observed at the Charity Hospital of Louisiana during the ten-year period ending July 1, 1939, 21 of the number being identified within the last two years. Four of the patients were white, and represent the first instances of this disease to be reported in white women.

The clinical and histopathological features of the lesion are discussed. The diagnosis is dependent upon the demonstration of the pathognomonic cell-containing Donovan bodies, which are most readily identified by the use of fixed biopsy material and the silver impregnation method of Dieterle.

Carcinoma of the cervix is easily confused with cervical granuloma inguinale, and 27 of the 38 cases in this series were so diagnosed. The clinical similarity of the two conditions is responsible for the error.

Vaginal bleeding and pelvic pain were the outstanding symptoms.

Intravenous antimony therapy is the most effective form of treatment, and tartar emetic gives the best results. The duration of treatment is shortened if large growths are completely excised by means of the cautery knife before specific therapy is begun. Recurrences are common.

Granuloma inguinale of the cervix is a clinical entity which demands general recognition and further study. Only by these means will the true incidence be established and improved methods of diagnosis and treatment evolved.

EDWARD L. CORNELL, M.D.

Desaive, P.: A Rare Case of Uterine Cancer: Adeno-Acanthoma of the Cervix Followed After an Interval of Two Years by a Papilliferous Adeno-Epithelioma of the Body of the Uterus (Une observation rare de cancer utérin: Apparition, à deux ans d'intervalle, d'un adéno-acanthome du col, puis d'un adéno-épithéliome papillifère du corps). *Rev. belge d. sc. méd.*, 1940, 12: 12.

In cancer of the uterus, the tumor usually presents a remarkably fixed histological structure. Thus, if the tumor originates in the cervical region as an epidermoid, it will maintain this character even though it should spread to involve the entire organ. If, on the contrary, it springs from any portion of the body of the uterus, it will present the same aspect on attaining the cervix as at its site of origin, i.e., of a glandular epithelioma. The present

writer therefore believed that it would be of interest to report a case presenting successively two histologically different forms of tumor, the first in the cervix and the second in the body of the uterus.

A woman of forty-four years with a negative family history and suffering from cholelithiasis was admitted to the Anti-Cancer Center of Liége in January, 1935, because her previously normal menstrual periods had become profuse for a period of two years, after which she suffered from a slight but continuous discharge. Examination revealed what was taken to be a cancer of the cervix of the second grade according to the Geneva classification. Histological study of a specimen removed from the site of cervical ulceration revealed a structure corresponding to adeno-acanthoma. Radium was applied vaginally and in the uterus, and was followed by roentgenotherapy. The patient was carefully followed up and remained in excellent health for two years and one month following the cessation of treatment. At this time examination revealed a micro-ulceration of the cervix and a grayish discharge. Simultaneously she developed tuberculosis of the right cervical glands with fistulization. Five months later she suffered an attack of metrorrhagia of two days' duration. Three years after her first admission to the hospital she suffered severe hemorrhages. Histological examination of the biopsy specimens from curettage at this time revealed a papilliferous adeno-epithelioma. A total Wertheim hysterectomy was performed with excellent results. The patient was still in good health when seen one and one-half years later.

In attempting to explain the origin of cervical adeno-acanthoma, it has been suggested that there may be a bicentric cancerization of both the lining epithelium and of the glandular epithelium. Another theory is that of a possible partial mutation of pavement epithelium into prismatic epithelium during the course of cancerization, with metaplasia preceding or following the neoplastic transformation of the mucosa.

The author is of the opinion that the bicentric theory is most applicable to cervical adeno-acanthoma. In discussing the possible relationship between the two neoplasms in this case, he presents various theories, the most plausible being that of a certain predisposition to neoplasm on the part of certain organs or organ systems. It was impossible to evaluate the part that might have been enacted by roentgen cancerization, although the latter is very rare in the genital tract.

The author concludes that in the presence of cervico-uterine malignancy of even slight extent, histological specimens should be taken from various levels, for the determination of the extent of the cancer is of far greater importance than its index of malignancy.

Surgery is the proper treatment. If indicated, radiotherapy should follow and should be given in such a manner as to ensure complete and final atrophy of the entire uterine mucosa. For this reason the intra-uterine application of radium is of importance. It is possible that too weak dosage of radium in the present case may have been responsible for the later development of the adeno-epithelioma.

EDITH SCHANCHE MOORE.

Strauss, A.: Irradiation of Carcinoma of the Cervix Uteri in Pregnancy. *Am. J. Roentgenol.*, 1940, 43: 552.

Most authorities today agree that carcinoma of the cervix is treated in most instances as well by irradiation as by surgery, if not better. The author of the present article analyzes the question whether or not concomitant pregnancy changes this dictum.

The report is based on 280 cases published between 1895 and 1936, inclusive, with the addition of 1 unpublished case treated by Pomeroy and 2 personal cases. The collected data of 90 articles are tabulated according to the name of the authors, year of publication, duration of pregnancy, type of irradiation, methods of operation, and results on mother and child.

The most frequent age incidence is given as the fourth decade (66 per cent), with the oldest person forty-eight years and the youngest twenty-one years of age. Mussey observed carcinoma of the cervix occurring in 1 of every 437 and Hirst in 1 of every 12,383 cases of pregnant women.

Pregnancy does not tend to develop an immunity to carcinoma. Only 10 women were primiparas and 21 were para-ii, whereas the remaining were from para-iii to para-x, the average for all being 5.4 pregnancies per patient.

It is not altogether certain that the pregnancy hastens the rate of growth of the carcinoma as often assumed. On the other hand, carcinoma has its effect on pregnancy by retarding the development of the child and by acting as a possible source of hemorrhage or infection.

The usual main symptom that will bring the patient to a physician is bleeding from the vagina. The leucorrhea, even after it becomes foul, may last for several months before the patient pays any attention to it.

As to the treatment to be followed, the author recommends the following rules:

1. If the growth is operable and the child inviable, disregard the child and remove all pelvic organs; then administer postoperative irradiation.

2. If the growth is operable and the child viable precede the operation with an abdominal cesarean section.

3. If the growth is inoperable and the child viable perform an abdominal cesarean section and use postoperative irradiation.

4. If the growth is inoperable and the child inviable, the choice rests with the family. Preference should be given to thorough irradiation to cause abortion, and then further irradiation as indicated. If pregnancy is in the later months irradiate and perform cesarean section as soon as the child is viable; then irradiate again if necessary.

From a study of the results, as a whole, it appears that irradiation, because of the danger to the offspring, cannot be used so thoroughly nor so efficiently as in the non-pregnant woman. Nevertheless, it is a valuable adjunct to surgery under any of the four conditions. T. LEUCUTIA, M.D.

Pitts, H. C., and Waterman, G. W.: A Further Report on the Radium Treatment of Carcinoma of the Cervix Uteri: 135 Additional Cases with Five-Year Follow-Up. *Am. J. Roentgenol.*, 1940, 43: 567.

In the October, 1937, issue of Surgery, Gynecology and Obstetrics, the authors reported a five-year follow-up on 173 cases of cancer of the cervix uteri treated by means of interstitial radium needles. Now they wish to report on an additional 135 cases treated between 1931 and 1933 by the same method. The total figure of 308 represents an absolute value. If 19 cases too advanced to treat, 11 "cervical-stump" cases, and 14 cases treated with radium and/or roentgen irradiation elsewhere are deducted, a relative value of 264 cases is obtained. The five-year survival for the absolute cases amounted to 32.1 per cent with the following distribution for the various stages: I (15 cases), 80 per cent; II (97 cases), 54.6 per cent; III (110 cases), 30.9 per cent; and IV (86 cases), 0 per cent. The relative survival rate was 36 per cent. Thus it is demonstrated that the method continues to lead to uniformly satisfactory results and that the incidence of complications is no higher than is experienced in other forms of radiation for cancer of the cervix.

Briefly the method consists in the interstitial implantation of long platinum filtered radium needles of low intensity into the paracervical and parametrial tissues together with the insertion of a stronger radium capsule into the cervical canal. The distribution is such that a dosage of 6,000 mgm.-hr. in the parametrium and of 3,300 mgm.-hr. in the cervical canal is obtained. However, one application is planned to last for six or seven days, during which time the radium, of course, remains undisturbed. It is not believed that the addition of roentgen therapy has materially affected the five-year results.

It would seem that the implantation of long radium needles through the vaginal fornices into the parametria in the presence of a sphacelating cancer invites disaster either from secondary infection or from fistula formation. However, this fear is not borne out by the authors' experience. In the entire series there was a mortality of slightly over 1 per cent from sepsis which may be attributed to the method, and the incidence of fistulas was 7.9 per cent, a figure not larger than occurs naturally or with any other method of radium treatment.

T. LEUCUTIA, M.D.

Masson, J. C.: Total Versus Supravaginal Hysterectomy. *Am. J. Surg.*, 1940, 48: 255.

Operations on the uterus for benign conditions constitute a large percentage of the major operative procedures on any gynecological service. The type of operation to be performed in any given case depends not only on the pathological condition, the patient's age, her marital state, the state of her general health, and to some extent her wishes in the matter, but also on the experience of the surgeon and the results he has obtained with various types of operations in similar cases.

One of the most controversial points among gynecologists is whether to do a total abdominal hysterectomy or a supravaginal amputation in the majority of cases in which it is advisable to remove at least part of the uterine body. The author is satisfied that when total abdominal hysterectomy is done by competent surgeons in a large series of cases, the end-results are better, the morbidity is less, and the mortality no greater than when subtotal abdominal hysterectomy is done in a similar series of cases by the same experienced surgeons. The occasional operator or any surgeon who has not taken special pains to become thoroughly familiar with the technique of a total abdominal hysterectomy is advised to continue doing the subtotal operation in a large majority of his cases even at the risk of leaving an infected cervix which might require treatment or removal at a later date.

Danger of cancer developing in the cervical stump is not the only reason for its removal, but cancer developing at this site is more frequently reported than formerly. Statistics are very unreliable in such cases. The weight of statistical evidence, however, is that cancer occurs in probably not more than 1 or 2 per cent of cases in which a subtotal hysterectomy has been performed for benign conditions.

From January 1, 1934, to December 31, 1938, inclusive, hysterectomy was performed for benign conditions in 3,149 cases at the Mayo Clinic. Among the 1,776 cases in which total abdominal hysterectomy was performed, 22 or 1.2 per cent of the patients died; among the 766 cases in which subtotal abdominal hysterectomy was performed, 7 or 0.9 per cent of the patients died, and among the 607 cases in which vaginal hysterectomy was performed, 9 or 1.5 per cent of the patients died. During the years 1936, 1937, and 1938, the author performed 784 hysterectomies with 6 deaths, or a mortality of 0.76 per cent; 196 of these were vaginal hysterectomies with 1 death, a mortality of 0.51 per cent.

In recent years the author has become more and more convinced that a total hysterectomy is advisable in most cases in which it is necessary to remove any of the uterine body of women who have been delivered of children by the vagina and who are close to or at the menopausal age, provided the surgeon is familiar with the technique of such an operation and can complete it within an hour. The three most important considerations in a low operative mortality are: (1) a well given anesthetic; (2) adequate exposure; and (3) no unnecessary delay in completing an operation.

In recent years the author has adopted the practice of removing the fallopian tubes whenever hys-

terectomy is performed. If a total abdominal hysterectomy is properly performed there is no tendency to prolapse of the vaginal vault or shortening of the vaginal canal. Neglect to repair the perineum often accounts for an unsatisfactory result following abdominal hysterectomy. Morbidity is most frequently due to thrombophlebitis, low-grade pelvic peritonitis, and firm adhesions of loops of the small intestine deep in the pelvis.

Operative technique was described in detail.

ADNEXAL AND PERIUTERINE CONDITIONS

Sailer, S.: Ovarian Dysgerminoma. *Am. J. Cancer*, 1940, 38: 473.

Five cases of ovarian dysgerminoma are reported in young women between the ages of ten and twenty-one years. Four of the tumors occurred in the right ovary and one in the left. This group represents an incidence of 6.1 per cent among a series of 80 primary malignant ovarian tumors.

The microscopic appearance of these tumors, including the number of mitoses, appears to be an unreliable indicator of growth potentiality. All of the tumors studied were very cellular and showed a striking resemblance to testicular seminomas. One tumor, in a ten-year-old girl, recurred a year following removal, with extensive pelvic, peritoneal, and probably lung metastases. Death occurred one year and eight months after removal of the primary growth. Three other patients are living and well without evidence of tumor, three, four, and six years after operation. The remaining patient is symptom-free eight months following removal of the tumor. None of these still living received x-ray therapy either before or after operation.

Clinically, the best indication of the degree of malignancy is the amount of infiltration of the tumor capsule at operation or extension into the adjacent lymph nodes. Dissemination of the tumor is usually confined to the peritoneal cavity, following the lymphatic route. Widespread metastases are distinctly uncommon, though discrete liver and kidney lesions have been reported.

One patient had a child born two years prior to removal of the tumor, and had two normal full-term pregnancies two and four years, respectively, following the operation. CHARLES BARON, M.D.

MISCELLANEOUS

Lax, H.: Hypomenorrhea (Die zu schwache Regelblutung). *Geburtsh. u. Frauenheilk.*, 1939, 1: 681.

While numerous investigations and discussions are concerned with hypermenorrhea, little attention has been paid to hypomenorrhea. Only the view that hypomenorrhea is the expression of an insufficient ovarian function is widely held. The underlying purpose of the investigation was to determine the causes of hypomenorrhea and, especially, to discover its relationships to ovarian insufficiency. Forty-five women with extreme degrees of hypomenorrhea were examined, in whom the duration of the menses varied up to thirty-six hours and the degree varied between a brownish flow up to the use of one pad. Neither the determination of the amounts of prolan excreted in the urine nor the clinical symptomatology revealed any support for the view that ovarian insufficiency was the cause in the cases of hypomenorrhea observed. Accordingly, all the therapeutic endeavors to strengthen the hypomenorrhea with high doses of folliculin or prolan were fruitless. Just as fruitless was the search for an anatomical cause of the hypomenorrhea. A hypoplasia of the uterus was found only in 5 cases. The histological examination of the mucosa curetted one or two days before the menses showed the picture of a normal secretory phase in 17 cases and an inferior mucosa with a slight glycogen content and slighter secretion in only 3 cases. Since the latter finding is also present in other conditions, it is not characteristic.

The cause of the hypomenorrhea should be sought rather in an abnormal tendency toward contraction of the capillary vessels, which takes effect immediately after the shedding of the mucosa. While neither the morphological blood picture nor the determination of the bleeding and blood coagulation time revealed any peculiarities, the testing of the capillary resistance according to the method of Stephan revealed a negative endothelial symptom on the day before the menses in all of the 10 cases examined. This was in contrast to the symptoms in women with normal degrees of menstruation, in whom a positive result was achieved 8 times in 10 investigations. Therefore, the normal diminution of the capillary resistance previous to menstruation does not occur in the case of hypomenorrhea.

In explanation of the increased capillary contraction one may refer to the increased contracting catabolic albuminous substances produced by the degeneration of the mucosa; to the excess of calcium which acts as a stimulant to the sympathetic system in women with a particularly labile sympathetic system; or to a disturbance of the central sympathetic centers. In relation to the latter, the associated symptoms, which were found strikingly often in cases of hypomenorrhea, deserve consideration: nausea, vertigo, psycholability with occasional depressions, and a distinctly increased blood pressure.

While hormone therapy is bound to lead to failures, occasionally a transient strengthening of the menses, and, especially, an improvement of the general symptoms may be achieved with hydrotherapeutic measures (alternating sitzbaths, and half baths with brush scrubbing). Treatment of the menstrual flow is unnecessary, especially as spontaneous recoveries are frequently observed.

(H. KOLBOW). LOUIS NEUWELT, M.D.

Thévenard, P.: Disease of the Vesical Neck in the Female (La maladie du col vésical chez la femme). *J. d'urol. méd. et chir.*, 1939–1940, 48: 296.

The author reports a case of incomplete retention of urine in a woman thirty years of age which was

apparently due to obstruction of the vesical neck which simulated prostatism in the male. The condition was successfully treated by coagulation.

A brief review of the literature on the subject is presented and attention is directed to the apparent rarity of the condition as only 91 cases have been reported. However, the author is of the opinion that the condition occurs more frequently than is commonly realized.

The diagnosis is based upon the history of progressive dysuria, the presence of residual urine, and the endoscopic characteristics, which consist of the presence of pillars and thickness of the sphincter. A discussion of the differential diagnosis is given and the conditions considered include lesions of the spine (tabes, spina bifida, and myelitis), urethral stricture, cystocele, and so-called "neoformations."

The treatment consists of resection of the neck either by the transvesical or transurethral route. The author prefers regional anesthesia and the specially constructed loop of Hendrickson to be used with the resectoscope. He believes that it is desirable to remove the tissue circumferentially. The two most important complications are hemorrhage and infection. In an attempt to obviate the latter the pre-operative and postoperative administration of sulfanilamide is suggested. The results of operation have been very good.

The pathogenesis of the condition is discussed. The two most seriously considered theories are inflammatory and muscular hypertrophies of the vesical sphincter. The pros and cons of these theories are briefly reviewed. Another theory is based upon the pathological alterations of a group of glands in the female analogous to the prostate in the male; thus, the condition is considered comparable to "prostatic hypertrophy in the female." The author, however, is not in accord with those who have advocated the latter theory.

MICHAEL DEBAKEY, M.D.

Puxeddu, E.: A Pathologico-Anatomical Review of Tuberculosis of the Female Genitalia (Rilievi anatomo-patologici sulla tubercolosi dei genitali femminili). *Riv. ital. di ginec.*, 1940, 23: 211.

There is considerable discrepancy between the clinical and anatomical statistics on tuberculosis of the female genitalia. At Florence, Ferroni found the total incidence of genital tuberculosis to be 4.5 per cent, and at operation 2 per cent. Falco of Parma reports an incidence of 1.5 per cent. Mossa of the Cagliari Clinic diagnosed 90 cases of genital tuberculosis in a series of 2,930 patients treated between 1907 and 1927. Of these 66 (3.1 per cent) were confirmed by histological studies. In Sardinia the highest incidence is reported as 26 per cent by Stolper, and 30 per cent by Fostner. Merletti, on the basis of anatomical studies, reports an incidence of 32.8 per cent among women between the ages of fifteen and forty-five years. In general genital tuberculosis is fourth on the list of incidence, pulmonary, digestive, and renal tuberculosis preceding it. In the author's series of 1,205 autopsies genital tuberculosis in women occurred in 3.1 per cent. On the basis of statistical analysis he estimates the total incidence in Italy among all persons to be from 2 to 2.5 per cent.

As concerns distribution according to age, Pestalozza found 10.8 per cent of 55 infants had genital tuberculosis with a marked tendency to tuberculous peritonitis. Ferroni presented a tabulated list which indicated that the highest incidence of female genital tuberculosis occurs in the age group of twenty-one to thirty years (44 per cent), and the next highest in the group of thirty-one to forty years (32 per cent). In the author's material an incidence of 47.7 per cent was found in the age group of twenty-one to thirty years. In general, genital tuberculosis is most frequent between the ages of twenty and forty years and least frequent before the age of sixteen years.

The cycle of menstruation particularly predisposes the genital organs to tuberculous infection, but the greatest influence is exerted by the reproductive process (pregnancy, parturition, puerperium). The physiological changes of pregnancy favor a genital tuberculous infection. The author presents the anatomical findings in 3 cases to illustrate the effect of the reproductive processes on genital tuberculosis:

Case 1. A forty-year-old woman in the puerperium. At autopsy a deforming fibro-adhesive peritonitis (perihepatitis, perigastritis, perisplenitis, with a thick plastic membrane) and recent serofibrinous exudate were found. The ovaries were reduced to hollow shells containing yellow, caseous material, and both ovaries and tubes were covered with a fibrinous membrane. The voluminous puerperal uterus presented a tuberculosis of the corpus and of the neck.

Case 2. A twenty-six-year-old para-iii. During the puerperium of her last pregnancy pains developed in the lower abdomen, with an irregular loss of blood, and more or less intense fever. Exploratory laparotomy was done at the obstetrical clinic. The patient died several days later (two months after delivery). All the abdominal viscera were matted together. There were numerous caseous masses the size of a nut. There was no fluid exudate. The mesenteric lymph nodes were enlarged and caseous. The left ovary was a caseous mass. The fundus of the uterus was involved in the adhesions and the uterine mucosa appeared caseous.

Case 3. A thirty-one-year-old woman who died two months after an abortion. The right ovary was transformed into a sac containing a yellowish-white liquid. The tube on the same side was enlarged and contained the same sort of material as the ovary. The uterus was enlarged and in its cavity were a few c.cm. of thick yellow fluid. The mucosa and neck of the uterus showed superficial tuberculous ulcerations.

Pregnancy and the puerperium also favor miliary dissemination of the tuberculous infection throughout the genital tract. Operative trauma predisposes to the development of genital tuberculosis, as well as

malformations which cause dystrophy and dysfunction of the genitalia. The author found that 15.2 per cent of his series had uterine hypoplasia. He believes that in most cases genital tuberculosis is of hematogenous origin. In 78 per cent of the cases of genital tuberculosis a pulmonary tuberculosis was also found. Peritoneal tuberculosis is secondary to the development of genital tuberculosis. As to the differential incidence in the genital apparatus the author presents the following data: ovaries, 43.4 per cent; tubes, 76 per cent; uterus, 56.5 per cent; and vagina, 13 per cent. Tuberculosis of the tubes is the most frequent manifestation of genital tuberculosis. Tuberculosis of the vagina and the vulva are most rare. The author encountered tuberculous ulcerations of the posterior fornix of the vagina.

JACOB E. KLEIN, M.D.

Huet, J. A., Comte R. J., and Herschberg, A. D.: Diethylstilbestrol, A Synthetic Estrogenic Substance (Le 4-4, di-hydroxy-α-β-di-éthyl-stilbène [Diéthylstilboestrol] Substance oestrogène synthétique). *Gynécologie,* 1939, 38: 517.

The recent work of Dodds and his coworkers on the synthesis of stilbestrol again attracts attention to the follicular hormone. This product, chemically different from folliculin, possesses all its properties, and in addition may be administered by mouth and is more economical. The author reviews the history of the drug and notes that in 1936 Dodds demonstrated active estrogenic properties in 4-4 di-hydro-di-phenyl. The author then describes the chemical characteristics of di-ethyl-stilbene.

Experiments on the ovariectomized rat show that the subcutaneous administration of 0.3 gr. induces estrus in from three to five days. It also causes a progressive hypertrophy of the uterus, which depends on the dosage. Thus, 1 gamma causes hypertrophy of the myometrium; 50 gamma also cause endometrial hypertrophy; 200 gamma cause a massive endometrial hypertrophy with hypersecretion. On castrated rats it induces mature reactions in the vaginal mucosa. Like folliculin it depresses the action of the ovaries. Like estrone, it sensitizes the endometrium to the action of progesterone. It stimulates the development of the mammary glands in immature animals. Embryological experiments indicate that it has a feminizing influence; in these experiments from 82 to 84 per cent of the offspring were females and from 16 to 18 per cent were intersexual; there were no males. This substance inhibits the action of the androgenic hormones and all of its effects are rendered reversible by progesterone. Other pharmacological effects of the drug are: diminution of the oxygen consumption; delay of increase in weight; inhibition of the anterior hypophysis; lowering of the arterial tension; dilatation of the capillaries; and inhibition of uterine and intestinal peristalsis. The drug seems to have an affinity for the sympathetic system.

Toxicity experiments indicate that from 30 to 50 mgm. per kilo given intravenously cause the death of a rabbit in convulsions within from one to two minutes. This corresponds to 1 gm. of the drug used clinically. In dogs the drug causes an anemia. However, such massive doses are never used clinically. It has a carcinogenic action, but to a less degree than estrone.

In 1938 Guldberg first used the drug clinically; a castrated woman had a menstrual cycle after the administration of 20 mgm., followed by 30 mgm. of progesterone. In gynecology it has been used in amenorrhea, oligomenorrhea, dysmenorrhea, genito-mammary hypoplasia, and in the menopause. The author presents a series of 46 brief clinical reports on the treatment of these conditions under his own observation. He concludes that the major indication for this drug is dysmenorrhea and oligorrhea. It has an ameliorating influence on certain menopausal manifestations. Intolerance to the drug is indicated by nausea, vomiting, and diarrhea; these symptoms cease when the drug is discontinued. The standard dose is 2 mgm. per day in 2 doses, taken after meals for from eight to eighteen days. To inhibit the hypophysis 3 mgm. are given for about four days.

The author concludes that in his series of cases the best effects were noted in infantilism of the genital tract, dysmenorrhea, oligomenorrhea, in the menopause, and in pituitary-ovarian imbalance. He obtained success in 77 per cent of his patients with menstrual dysfunction, and in 82 per cent with menopausal disturbances. Benign symptoms of intolerance were noted in 10 per cent of those taking the drug, and serious symptoms in 3 per cent of the patients. To avoid disappointments in its use, the drug should be given only after precise clinical and etiological diagnosis. The author presents a complete bibliography on the subject.

JACOB E. KLEIN, M.D.

Bishop, P. M. F., and Others: Estrogenic Properties of Stilbestrol Dipropionate and Hexestrol. *Lancet,* 1940, 238: 629.

Bishop reports the effects of the administration of stilbestrol dipropionate and hexestrol in certain gynecological conditions. The former drug is an ester of stilbestrol, synthetically prepared, with a prolonged activity. Hexestrol is a highly active polymer of anol, a hydrogenated form of stilbestrol in which the double bond has been removed between the two carbon atoms. The two drugs were given, alone or in combination, to three general groups of cases. The first group was comprised of menopausal patients with both subjective complaints and objective difficulties such as an atrophic condition of the vagina. Relief was obtained in 91.2 per cent of 103 cases. Twenty-seven per cent of the hexestrol cases did not respond, probably because of the low dosage given. The second group consisted of 48 patients with amenorrhea. Drug administration produced "uterine hemorrhage" in 28 of these cases. The types of amenorrhea were not differentiated. A third group, consisting of a

small series of cases of dysmenorrhea and cases in which inhibition of lactation was required, showed poor results in dysmenorrhea and uniformly successful results with regard to the inhibition of the lactation.

Toxic symptoms, such as nausea, vomiting, and occasional jaundice, were observed in 10.3 per cent of the total cases. Bishop states that the toxicity of stilbestrol dipropionate was about five times as great as that of hexestrol and roughly the same as that of stilbestrol. No serious associated effects were recorded. The average single dose associated with toxic symptoms was 3 mgm. as compared with an average single dose of 2.3 mgm. after which toxic symptoms did not appear. The average total dosage free of toxic symptoms was 96.2 mgm. as compared with 139.2 mgm. total dosage which was productive of toxic symptoms. A personal idiosyncrasy to stilbestrol may exist. To the two drugs discussed Bishop ascribes estrogenic properties which are similar to those of stilbestrol.

WILLARD G. FRENCH, M.D.

Sannicandro, G.: The Action of Synthetic Testosterone on the Vaginal Epithelium of Castrated Women (L'azione del testosterone sintetico sull'epitelio vaginale delle donne castrate). *Atti d. Soc. ital. di ostet. e ginec.*, 1940, 36: 23.

The author continues his studies on the action of various hormones on the vaginal mucosa, and reports 4 cases of oophorectomized women whom he treated with testosterone propionate. Two of the subjects had been operated upon several months previously; the third one year before; the fourth many years ago.

The procedure consisted of gross examination and biopsy followed by the parenteral administration of from 100 to 120 mgm. of testosterone, given in doses of 20 mgm. over a period of fifteen days. At the conclusion of therapy a second biopsy was taken, and the results were compared.

In general, all cases showed the characteristics of atrophy on the first examination: the epithelial strata were reduced in number, and the cells were diminished in volume and in glycogen content. In 2 of the 4 cases under observation there had been evidence of inflammation, with redness and leucorrhea. In these there was a prompt remission after therapy. All 4 subjects demonstrated profound modifications consisting of an increase in the number of epithelial strata, in the volume of the individual cells, and in the glycogen content.

The interpretation of this folliculin-like action is difficult. The testosterone may act directly upon the vaginal mucosa or indirectly by means of some other endocrine gland, presumably the pituitary; or it may be converted into the structurally similar folliculin. Whatever the mechanism of action is, the author believes that there are definite indications for its use, chiefly when the presence or possibility of cancer makes the administration of folliculin inadvisable.

EDITH FARNSWORTH, M.D.

Robecchi, E.: Radiology in Feminine Sterility (La radiologia nella sterilità femminile). *Ginecologia*, 1940, 6: 1.

The author evaluates the role of radiology in the study of sterility in the female, first in diagnosis, second in therapy. Although infrequently indicated and technically difficult, pneumoperitoneum may offer information which in some cases cannot be obtained by other approaches. Originally advanced by Wintz and Dyroff, it has proved useful in the determination of the degree of fixation in uterine displacements, and in differentiation of tumors and congenital anomalies of the genitalia, ovarian tumors, and alterations in the tubes, all of which may serve as the cause of sterility. This method may even be combined with hysterosalpingography which, by the introduction of gas or an opaque medium in the genital tract provides a picture of the internal contours. Colpography also has been of assistance in determining the presence and character of malformations of the vagina. Hysterosalpingography merits special emphasis as the simplest and most effective method of visualization. First used by Cary in 1914, it was not until the discovery of lipiodol for this purpose in 1925 that the procedure became safe enough to be incorporated in the ordinary armamentarium of clinical practice.

Various techniques have been employed: the first, with the syringe accurately placed in the cervical canal so that the opaque material can be injected at high pressure without escape of air; the second, with the canal open, the material being dropped without pressure into the uterus; the third, again a closed method, by which a definite quantity (2 or 3 c. cm.) is injected under a fixed pressure (not greater than 100 mm. of mercury). It should be borne in mind, with reference to the tubes, that although in 60 per cent of the cases of sterility the lumen has undergone more or less profound changes, it is to be noted that there are other important considerations: the examination must be made in the first fifteen days of the menstrual cycle because of the hypertrophy of the endometrium which occurs in the latter half of the cycle and tends to obliterate the interstitial portion of the tubes; the technique of the procedure must be perfect, and finally, tubes and uterus must be functionally competent if the iodized oil is to permeate the cavity, since pressure alone will not fill the organs if the muscular tone is lacking. Among the possible complications arising from the practice of hysterosalpingography are inflammatory reactions arising in the tubes, ordinarily from unrecognized previously existing infection, peritoneal reactions, penetration of the lipiodol into the blood vessels and lymphatics, traumatic perforation of the uterine wall, endometriosis, iodism, and interruption of pregnancy.

With regard to therapy, the place of radiology is much less gratifying, cured cases being estimated at not more than 20 per cent. If the tubes are occluded, the incidence of cure is not above 0.5 per cent, unless the occlusion consists merely of a mucus plug, a

small blood clot, or slight adhesions. If patent, salpingography tends to favor conception. It is also probable that extra-uterine pregnancy is so favored. Employed on the endocrine system, radiology is said by Baer and Mazer to offer promising results in the treatment of menstrual disturbances. By modifying the dose, roentgentherapy can be used to excite or depress the involved structures. This type of therapy, however, has lagged far behind the hormonal approach, and the mode of action on the maturing follicle directly by the rays or indirectly by the pelvic hyperemia is far from certain. Equally dubious is the action of irradiation on the gonads through stimulation of the thyroid and the pituitary glands. The author contributes in this connection a series of cases, 34 in number, in which the patients complained of menstrual deficiency, and were treated by irradiation of the ovaries and in some cases irradiation of the pituitary gland. Improvement was noted in a fair percentage of cases, but the improvement tended to be of short duration. Of the 34 patients treated, 21 were married and 16 of these have been carefully followed. Of the latter, 4 became pregnant after an interval varying from eight months to two years. The single contraindication to ovarian irradiation with small doses is conceded to be the presence of infection.

The apparatus employed was of the Duval type, and the factors were: tension 170 kv., intensity 3 ma., filter 0.5 mm. of copper plus 3 mm. of aluminum, half-value layer of copper 0.8 mm., distance 40 cm. with a circular field of 13 cm. diameter over the ovaries. From 125 to 150 roentgens were given in two treatments at an interval of one week. Irradiation of the thyroid has proven more successful in diminishing the duration of the menses in the hyperthyroid than in the converse condition. The thymus gland has also been studied as to its radiosensitivity. In this connection, a group of cases characterized by hypoplasia of the genitalia with retarded pubescence adenoids, congenital splenomegaly, retarded dentition, hypoglycemia, hypertension, epistaxis, lymphocytosis, monocytosis, and depressed basal metabolic rate—the so-called hyperthymic syndrome of Pende—have been definitely improved by irradiation. EDITH FARNSWORTH, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Merlino, A.: Primary Cervical Pregnancy (Gravidanza cervicale primitiva). *Arch. di ostet. e ginec.*, 1940, 4: 42.

Since cervical pregnancy is the consequence of extracorporeal development of the ovum, it is a variety of ectopic pregnancy. It is the rarest form, in the entire literature there are only 35 cases recorded. The author reviews the literature from Chavanne (1861) to Schuerger (1937).

The author reports the case of a patient, a thirty-three-year-old housewife who was in her first pregnancy. Her previous history had been uneventful. Menstruation began at thirteen years. Her menstruations had been irregular and of four or five days' duration. Early in pregnancy she had the usual mild disturbances. However, before term she began to complain of pains in the sacrolumbar region and began to pass blood profusely from the cervix. General physical examination was negative except for a marked anemia. The Wassermann test was negative. The uterus was inert and did not react after prolonged massage. Palpation indicated that the fetal parts were in direct contact with the abdominal wall. The vertex was down in the pelvis and the breech was higher up. The small parts were felt anteriorly and to the left. At the site of the cervix a voluminous sac was felt which distended the upper third of the vagina. The softened uterine orifice was dilated to an extent of 5 cm. The vertex presented into the cervix. The placenta was found adherent to the posterior wall of the cervix. The bony pelvis was normal in every respect. A diagnosis of placenta previa diffusa was made. Because of the condition of the patient and the position of the placenta a laparotomy was decided upon as the procedure of choice. At operation it was found that the amniotic sac was attached to the cervical canal, in which the ovum was implanted. A hysterectomy was done; the patient made an uneventful recovery in four weeks. (Figs. 1 and 2).

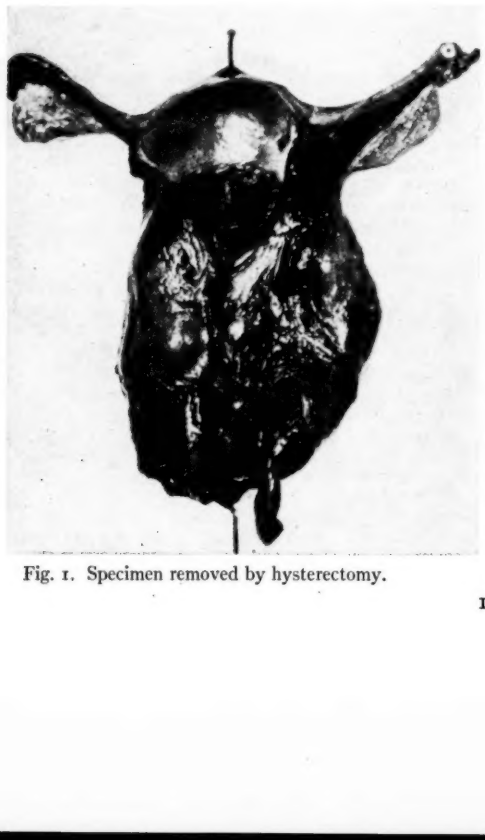

Fig. 1. Specimen removed by hysterectomy.

Fig. 2. Another view of specimen removed.

The corpus uteri was four times the normal size. The uterine mucosa was markedly hypertrophied and the uterine cavity was absolutely empty and free from any ovular elements. The uterus fixed in formalin had the following measurements: thickness of the anterior wall, 3½ cm.; thickness of the posterior wall, 3½ cm.; thickness of the fundus, 2 cm.; thickness of the decidua on the anterior and posterior walls, 1 cm.; length of the uterine cavity, 6 cm.; width, 3½ cm. At the level of the uterine isthmus the corpus uteri was continuous with a sac 16 cm. long which stopped above at the closed internal orifice, and below at the external orifice with a diameter of 4 or 5 cm. This sac, which contained the ovum, was of the greatest amplitude at the middle of the cervical canal, and measured 14 cm. in

transverse diameter and 8 cm. in its anteroposterior diameter. The placenta occupied the upper four-fifths of the posterior wall and spread over the entire internal uterine orifice. The cord was inserted laterally and to the right. The placenta was adherent to the cervical tissues and it was impossible to separate it from the cervix. It had the appearance of a diffuse placenta which had formed a most intimate union with the cervical myometrium. The external orifice of the cervix was regular and free from chorionic attachments. The tubes and ovaries were normal; the right ovary contained the corpus luteum of pregnancy. Microphotographs are presented in the original of the various tissues involved.

None of the reported cases attained full term; most of the patients aborted at two or three months, exceptionally at five or six months. There is not any characteristic symptomatology of the condition. Early it may be confused with abortion; later it is confused with placenta previa. Hemorrhage is the outstanding symptom. On pelvic examination the corpus uteri may be confused with a fibroid. Excessive length of the cervical canal may have been a contributing factor in the author's case. Prognosis is reserved since death is possible from hemorrhage. Therapy is directed at the prevention of this occurrence, usually by a hysterectomy.

JACOB E. KLEIN, M.D.

Fruhinsholz, A., and Richon, J.: New Findings Regarding "True Prolonged Pregnancy" and Its Significance (Nouvelles données sur la "gestation prolongée vraie" et sa signification). *Gynéc. et obst.*, 1939–1940, 40: 283.

Fruhinsholz and Richon define as true prolonged pregnancy, a delay in delivery until more than 300 days after the beginning of the last menstruation in women who have menstruated regularly every twenty-eight to thirty-one days. In such cases delivery occurs in the eleventh month after the last menstrual period, i.e., in the tenth month after the pregnancy has become evident by the cessation of menstruation. They have excluded from their series of prolonged pregnancies those in which delivery occurs from 280 to 300 days after the beginning of the last menstrual period, although this group might include some cases of true prolonged pregnancy.

In 1930, the authors reported a series of cases of true prolonged pregnancy, and since that time, they have recorded 128 new cases (1 a twin pregnancy) in a series of 19,803 deliveries, i.e., 0.65 per cent. The duration of the pregnancy as calculated from the beginning of the last menstrual period was from 301 to 351 days; in 92 cases the duration varied from 301 to 314 days after the last menstrual date, which represents a minimum duration of the pregnancy (from the time of impregnation clinically proved or of presumed nidation) of from 270 to 284 days. In the case in which pregnancy was most markedly prolonged (351 days after the last menstrual date), there was definite clinical evidence of syphilis and the Wassermann reaction was positive; in a number of other cases syphilis could be suspected clinically. In only 47 of the 128 cases in this series, could the mothers be considered entirely normal; there were an unusual percentage showing congenital stigmata, and others with evidence of pituitary and ovarian deficiency. In most cases the establishment of menstruation was delayed; and the history of the primiparas in the group showed that pregnancy had not occurred until some time after marriage in most cases.

The average duration of labor in this group was longer than normal, and more operative deliveries were necessary. The average size of the infant was greater than normal in this series, but the prolongation of labor and the necessity for operative delivery did not seem to be due to the large size of the child as much as to the uterine dystocia. The weight of the placenta was more than 600 gm. in 55 of the 128 cases. The fetal mortality was 13 deaths (more than 10 per cent), and 7 macerated fetuses were included; this is an unusually high fetal mortality, higher than in the authors' previous series of prolonged pregnancy, in which the fetal mortality was 7 per cent. Most of the infants were normal in appearance at birth, but one died of intestinal malformation, and another of melena intrapartum shortly after birth.

From their study of these two series of cases of prolonged pregnancy, the authors conclude that the induction of labor is not justified merely because the pregnancy is prolonged. In some cases the induction of labor is justified, as for example, when the patient has had a previous prolonged pregnancy with death of the infant. Also if the fetus dies *in utero* the woman should be promptly delivered. ALICE M. MEYERS.

Burger, K.: The Intra-Uterine Death of the Product of Conception During Pregnancy (La morte intrauterina del prodotto del concepimento in gravidanza). *Arch. di ostet. e ginec.*, 1940, 4: 1.

The author presents a review of intra-uterine death with an extensive bibliography. During the period from 1931 to 1932, there were 6,000 fetuses which died during pregnancy among 220,000 births in Hungary. Fetal mortality is of great significance not only from a familial but also from a national standpoint. Infectious diseases of the mother may cause death of the fetus during pregnancy. Tuberculosis and lues are the most important in this respect. Among the tuberculous gravidas 14 per cent abort and 41 per cent have premature labor. As in all infectious diseases including lues, death of the fetus is caused by transmission of the disease through the placenta, or by changes induced in the placenta by its infection. Lues causes intra-uterine death in 30 per cent of the fetuses. In organic heart disease 30 per cent of the pregnancies terminate in abortion, premature labor, or intra-uterine death of the fetus. Anomalies of maternal genital development tend to cause premature interruption of pregnancy rather than fetal death. Anemia during pregnancy may cause a 35 per cent fetal mortality. In hemorrhagic diathesis the fetal mortality is from 50 to 60 per

cent. Chronic nephritis and nephropathies cause a 70 per cent fetal mortality according to Zangemeister. Hypertension is associated with a 3 to 30 per cent fetal mortality which depends on the severity of the hypertension. In the author's clinic Biro reported a 4.5 per cent fetal mortality due to maternal hypertension after a five year study of the problem. However, in many cases, chronic nephritis is difficult to differentiate from toxemia of pregnancy. In 120 cases of toxemia of pregnancy Martinolli reported a fetal mortality of 42 per cent; in eclampsia, 47 per cent. According to Stuart, toxemia is the chief cause of intra-uterine death of the fetus. Kellogg reported 26 per cent fetal mortality in preeclamptic toxemia.

However, in many cases the cause of fetal mortality is unknown. Thus, Sellers could establish no cause for fetal death in 183 of 1,070 cases. Micheli could not demonstrate the cause of fetal death in 29.9 per cent. Gillespie could not find the cause of death in 15.97 per cent of macerated fetuses. Thus it is apparent that in many cases the cause of fetal mortality is enigmatic.

The endocrines exert an influence on the fetus. In diabetes it was found that the fetus was unusually overdeveloped, presumably because of the maternal hyperglycemia. The literature indicates that from 33 to 75 per cent of such fetuses die during pregnancy. The insulin therapy has not improved these results very much. The thyroid also exerts a marked influence. In hyperthyroidism there is a tendency to abort.

The ovarian hormones exert a profound influence during pregnancy. Zondek obtained good results in habitual abortion by the use of follicular hormone. Experiments indicate that follicular hormone sensitizes the uterine musculature to the action of the hormone of the posterior lobe of the hypophysis. The administration of large amounts of gonadotropic hormone has a harmful effect on the fetus during pregnancy.

The maternal nutrition also has an effect on the fetus. The vitamins are important. Deficiency of Evans' Vitamin X, and of Vitamins A, B, C, and D has an influence on the fetus. Maxwell and Preston note that intra-uterine death of the fetus may be induced by Vitamin-C deficiency. The importance of this vitamin during pregnancy is indicated by the fact that normally the placenta is a site for the deposition of Vitamin C. Vitamin E has an unquestionable influence on the genital organs, and its deficiency leads to abortion. Other elements of nutrition such as proteins, minerals, especially iodine, also have an important influence on the fetus during pregnancy.

Another factor to be considered in the intra-uterine death of the fetus is the male germinative cell. In veterinary medicine Hammond points out that a cause of atrophy of the fetal calf is immaturity of the spermatozoa of the bull. Hypovitaminosis may also cause damage to the germinative elements. Monch has pointed out the importance of quality in the spermatozoon, and has found anomalies which, if exceeding 20 per cent, may cause sterility. However, Monch thinks that if conception occurs this defect in the male element may have an adverse effect on the development and normality of the product of conception. It may be of significance even in the intra-uterine death of the fetus.

The germinative injuries from roentgen radiation have assumed an important place in the literature. Germinative lesions of the ovum cause its death before implantation. In other forms of life a so-called lethal gene has been described which causes the death of the developing individual. The rôle of such a gene in the human being is as yet unknown. It is surmised that the X-chromosome may be the carrier of recessive lethal and sublethal genes.

Abnormal prolongation of the duration of pregnancy may also lead to death of the fetus. Frigyesi has shown that in such cases there are regressive alterations in the placenta. Ogasawara doubts that there is a primary death of the fetus. He believes that the cause is usually to be found in the placenta. From experiments he has decided that these changes are usually hemorrhage, atrophy, or necrosis. Pataky has shown a correlation between follicular hormone and Vitamin C. The former increases at the end of pregnancy with an associated diminution of Vitamin C; the latter deficiency causes the death of the fetus in prolonged pregnancies.

Conditions affecting the placenta and the cord also may cause the death of the fetus. Such changes as placental infarcts; calcification; anomalies of the cord, such as one umbilical artery; and anomalies of the amniotic membranes and fluids (hydramnion) may cause death of the fetus.

The signs of intra-uterine death of the fetus are discussed. The Aschheim-Zondek test, the examination of fetal heart tones and movements, x-ray examination, the shrinking in size of the uterus, and the increased coagulation of the maternal blood are factors which aid in the diagnosis. Intra-uterine death of the fetus is of no particular danger to the mother. Spontaneous delivery usually occurs within four weeks in 98 per cent of the cases.

In conclusion, the author notes that many causes of intra-uterine death of the fetus are still unknown. In order to decrease these deaths it is necessary to have a precise understanding of these causes. The influence of modern knowledge of diet and vitamins is emphasized. Likewise, the importance of regular medical and obstetrical examinations is stressed. For the same purpose the general obstetrical knowledge of physicians will have to be improved, as well as the social condition of pregnant women; the latter is a social problem as well as a medical one.

JACOB E. KLEIN, M.D.

Verhage: Icterus in Pregnancy (Ikterus in der Schwangerschaft). *Nederl. Tijdschr. v. Verlosk.*, 1939, 42: 286.

Two consecutive cases of icterus in women with twin pregnancies gave occasion to establish under

which conditions jaundice occurred in pregnancy in the Utrecht Clinic during the last twelve years. Besides pregnancy with definite jaundice of the skin this consideration included also cases in which the bilirubin level of the blood was increased. First the case histories of 3 patients were given in which icterus occurred toward the end of the pregnancy. In 1 case birth with a living child followed at term; in the 2 other cases the women were confined prematurely, 1 with a macerated child. Since after birth the jaundice of all 3 women quickly disappeared, it was considered to be an icterus of pregnancy. Only 1 case of residual and hemolytic icterus of pregnancy was mentioned.

The occurrence of hyperbilirubinemia in patients with vomiting of pregnancy and with eclampsia was then discussed. Of 54 patients with hyperemesis gravidarum 53 left the clinic cured. One patient came in a stuporous condition without experiencing an icterus of the skin and died twenty-four hours later. In 53 patients the vomiting ceased sooner or later with medical treatment. Since women with hyperbilirubinemia react better to this method of treatment than women without it, the following seems logical: (1) jaundice in women with hyperemesis gravidarum is a consequence of the vomiting, and (2) the occurrence of jaundice in women with hyperemesis gravidarum is not an unfavorable prognostic symptom.

Whatever the transient occurrence of icterus in women with eclampsia signified, it was established that the icterus was never noticed before the onset of the paroxysms, and that, on the other hand, shortly after the attack the icterus quickly developed. From this it would follow that the occurrence of icterus in women with eclampsia was related to the paroxysms and not to the severity of the signs of intoxication. It would also appear that icterus in women with intoxication of pregnancy will be very rarely observed. The onset of icterus in eclampsia has, in general, been considered as an unfavorable prognostic sign. In 11 of 96 treated women with eclampsia a hyperbilirubinemia occurred. Of these 11 women, 2 died, 1 seven days post partum after the bilirubin level was again normal; the cause of death was oliguria. The other patient died fourteen hours after the first paroxysm at the time of a venesection. Of the other 85 patients with eclampsia in whom no elevation of the bilirubin of the blood was recognized, 11 died. From this evidence it follows that icterus in eclampsia should not be considered as an unfavorable prognostic symptom.

This conclusion is supported by the clinical history of the 2 women with twin pregnancies in whom within a short time marked jaundice with copious vomiting and diminution of the liver function developed. Both women recovered. On the basis of the clinical picture the possibility of an acute subacute yellow atrophy of the liver must be considered. It is probably true that in these cases the cause of the disturbance is to be sought in the changes of pregnancy and that notwithstanding a marked icterus the injury to the liver was not of a serious nature. As one of the factors which possibly had an influence on the appearance of the jaundice in both of these cases, hunger should be mentioned, since both women vomited very much and for several days had taken very little nourishment.

(Theo Puetz). John R. Paine, M.D.

Laffont A., and Pietri, M.: A Case of Antepartum Peritonitis of Undetermined Causation. A General Review of Peritonitis of Vague Etiology during Pregnancy (Sur un cas de péritonite antepartum de cause indéterminée. Revue générale des péritonites de la grossesse de déterminisme mal élucidé). *Gynécologie*, 1939, 38: 565.

A twenty-seven-year-old para-iv, pregnant six and one-half months, was admitted with the complaint of lumbar and abdominal pain. Five months after her last delivery she had developed right pyelonephritis due to the bacillus coli. This responded to treatment after several weeks. The present illness began with sharp lumbar pain radiating to the abdomen and accompanied by cold sweats and chills. There was vomiting, fever, and rapid pulse (140). During the previous week the patient had suffered from a mild diarrhea. The abdomen was distended. There was hyperesthesia of the skin, and rigidity on the right side, particularly in the right lumbar region. Urine examination revealed numerous colon bacilli. The general condition rapidly became worse and the signs of peritonitis more intense; the white blood count was 20,000. At laparotomy seropurulent fluid escaped from the peritoneal cavity. The appendix, tubes, and uterus were normal. Simple appendectomy was done and two drains were inserted. Blood culture was negative. Culture of the peritoneal fluid revealed pure colon bacilli. Recovery was slow and accompanied by complications such as parotitis, pyocyaneus infection of the wound, and failure of the wound to heal because of adherence of the fundus of the uterus to the upper part. By this time full term was at hand and it was decided to do a cesarean section because of the adherence of the uterus to the laparotomy wound. A midline cesarean section was done, followed by total hysterectomy. At operation it was noted that the right ureter was enlarged to the size of the thumb in the iliolumbar region. The patient and infant remained well. The placenta, uterus, and tubes did not show any serious inflammatory alterations. Cultures of the amniotic fluid, cord blood, pharyngeal mucus, vernix caseosa, and tubal secretions were all negative.

The author then proceeds with a review of the literature and a thorough discussion of the subject. He points out that there is a peritonitis of pregnancy closely related etiologically to the very nature of pregnancy. He tabulates and describes 9 such cases reported in the literature since 1919. Four of the mothers died. The author points out that all of these cases occurred in the last months of pregnancy and the colon bacillus was recovered in pure culture whenever bacteriological studies were done.

Simple drainage was usually successful in the treatment. It is thought that these cases are more frequent than the reports indicate, since many of them may be masked under the diagnosis of appendicitis.

In the pathogenesis of this condition there are two important factors: the weakening of the peritoneal resistant powers during pregnancy and the infectious rôle of colon bacilli during pregnancy. The author discusses these two factors in great detail with appropriate explanations from the literature. The diagnosis is usually made at operation or autopsy, since there is no typical clinical syndrome. The prognosis is favorable in all the cases treated surgically; 5 patients treated surgically lived; 4 untreated patients died.

The author favors drainage in the right iliac region and continuous morphine administration to prevent premature delivery is advised. If possible, cesarean section is done at term, preferably through the previous iliac incision, followed by hysterectomy.

A bibliography of the entire subject is presented.

JACOB E. KLEIN, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Butler, H. M., and Hill, A. M.: Hemolytic Streptococcal Infections Following Childbirth and Abortion. I. Determination of the Virulence of Group A Strains. II. Clinical Features with Special Reference to Infections Due to Streptococci of Groups Other Than A. *Med. J. Australia*, 1940, 1: 222, 293.

Lancefield's precipitin test enables one to distinguish that group of hemolytic streptococci most dangerous to man; but there is still lacking a simple method of determining the degree of virulence of individual Group A strains. In puerperal and abortal infections, Lancefield and Hare maintained that "Group A streptococci, if present in the vagina postpartum, almost always gave rise to serious puerperal infection." The authors' experience at the Women's Hospital, Melbourne, during the last two years has shown that of the women who yielded a pure or almost pure culture of streptococcus hemolyticus Group A from the vaginal swabbing, more than half showed the symptoms of only a mild infection.

The failure of these results fully to confirm Lancefield and Hare's statement is most readily explained on the assumption that different Group A strains vary considerably in their ability to produce severe human disease.

In this paper are reported attempts to devise a simple means whereby the likely course of a Group A puerperal infection could be determined in the initial stage of the illness.

The work of Hare suggests the probability that the virulence of the infecting strain is the important factor with regard to the severity of these infections. It seemed possible, therefore, that a study of the characteristics of Group A strains might reveal a correlation between the severity of the infection and the nature of the infecting strain.

The study of 101 Group A strains causing puerperal or abortal infection has shown that in this series it was possible to establish a relationship between certain properties of the strains and the severity of the infection.

The demonstration of capsules in young cultures established reliable correlation between the severity of infection and the nature of the infecting strain.

In general, the capsulated strains gave rise to severe invasive infections, while the non-capsulated varieties were associated with the mild cases. This correlation was in agreement with the ability of the strains to resist phagocytosis in freshly defibrinated human blood. The capsulated organisms were usually resistant to phagocytosis and were able to multiply in such blood, whereas the non-capsulated strains were readily taken up by the leucocytes.

The colony form on surface plates and in "sloppy" serum agar and the type of growth in serum broth also served to distinguish strains from severe cases from strains causing mild infections. However, the correlation was not so good as that resulting from the demonstration of capsules.

Fibrinolytic activity and hemolysin production did not prove of value in distinguishing the strains from the various types of cases. Griffith typing was of only limited value, because of the many strains which fell outside of the established types.

The results obtained show that in this series the capsulated strains were possessed of far greater capacity to invade the tissues and to set up an acute generalized infection than were the non-capsulated organisms. This is well shown by the strains from blood cultures. Of 22 such strains, 21 were capsulated in young cultures.

This finding agrees with the observation of Dawson and Olmstead (1934) that acute and fulminating infections were due to capsulated strains.

In regard to capsulated strains having a greater degree of infectivity, we have not obtained evidence of this in puerperal infections.

The authors believe that the examination of Group A strains for the presence of capsules in young cultures, either alone or in conjunction with observations on resistance to phagocytosis and colony form, should usually enable one to predict the probable severity of a puerperal infection within twenty-four hours of the isolation of the strain from the vaginal swab. If the demonstration of capsules alone is relied upon, a report can often be made within six or seven hours of detection of the growth of a Group A strain. In many instances it has been possible to determine the group and the presence or absence of capsules within twenty-four hours after taking the vaginal swab.

The second part of this report deals with a series of hemolytic streptococcal infections following childbirth and abortion in which infections due to streptococci of groups other than A assumed considerable importance, and in which, in addition, the majority of the women infected with Group A strains were not seriously ill.

Since June, 1937, at the Women's Hospital, Melbourne, vaginal cultures have been made as a routine measure from patients in the puerperium and after abortion when the temperature rose to 101° F. To the end of January, 1939, 864 such cases were investigated, and in 108 of these hemolytic streptococci were grown from the vaginal swab. During this period there also occurred a fatal puerperal infection due to a hemolytic streptococcus, in which the infecting organism was not detected in the vaginal cultures, and 1 case of peritonitis after abortion in which cultures from the vagina were not made. This paper deals with these 110 cases.

The hemolytic streptococci isolated from these cases were grouped according to Fuller's modification of Lancefield's precipitin test. Eighty-two patients were infected with Group A strains, 12 with Group B, 10 with Group C, and 6 with Group G.

While Group A streptococci were, as was to be expected, the predominant infecting organisms in this series of 110 consecutive cases of hemolytic streptococcal infection, they were not of exclusive importance. Streptococci belonging to Groups B, C, and G were responsible for 25 per cent of the cases.

The outstanding feature of the 82 infections due to streptococcus hemolyticus Group A was the high proportion of mild cases (70 per cent). In the authors' experience the mere identification of streptococci from the vaginal swab as belonging to Group A is not sufficient evidence on which to base the prognosis. The correlation observed by the authors between severity of infection and encapsulation, and to a less extent certain cultural characteristics of the infecting strain, has been recorded.

Of the infections due to streptococci not of Group A, those due to Group B streptococci were the most numerous and the most serious. Among the 12 women infected with Group B strains there were 4 deaths, 3 due essentially to the infecting streptococcus. In 2 of these cases the cause of death was acute infective endocarditis.

The 10 Group C infections were for the most part mild. That Group C streptococci can cause a severe infection, however, is evident from a case seen prior to this series and described by the authors.

There were 6 Group G infections, all mild. The only known serious Group G infection among the records of this hospital was 1 of septic abortion already reported by Macdonald (1939).

The mild infections due to streptococci of Groups B, C, and G did not differ clinically from mild infections due to streptococcus hemolyticus Group A.

DANIEL G. MORTON, M.D.

GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Caminiti, S.: The Descending Pyelogram in Renal Exclusion (La pielografia discendente nei reni esclusi). *Arch. ital. di chir.*, 1939, 57: 312.

An inquiry is made into the relationship of complete renal exclusion to the behavior of the kidney as it appears in the descending pyelogram. Ureteral ligation was done with silk in a group of rabbits and dogs. Following this, descending pyelograms were made at intervals from two hours to one hundred and thirty-two days and the resulting records were carefully integrated.

It was found that in the dog, an animal which closely resembles the human being both in anatomical structure and functional reactions, the image of the endorenal cavity could be obtained for from five to seven days after the ligation, but never later than that. However, the parenchymal shadow could be obtained, following the intravenous injection of the opaque medium, at intervals up to two to four months after ligation. This latter phenomenon could be explained only on the basis of persistence of renal function for that period of time, even if the function were attenuated or equilibrated with resorptive processes. The resorption of the opaque liquid was very rapid (about forty-eight hours) in recent ligations, but required from ten to twenty days if the ligation had been done a month or two. In the rabbits as well as in the dogs, the ligations always were found to cause alterations of the hydronephrotic type and never of the atrophic type.

It is concluded that in clinical pyelography, complete ureteral occlusion of from five to seven days' duration is not necessarily associated with absence of opacity of the endorenal cavity, nor with absence of opacity of the parenchyma. When making descending pyelograms in such cases, it should also be remembered that the rapidity of resorption of the opaque medium is somewhat dependent upon the length of time elapsed since the onset of the obstruction. FRANK MCDOWELL, M.D.

Bandler, C. G., and Milbert, A. H.: An Evaluation of Recent Concepts in Renal Surgery. *Surg. Clin. North Am.*, 1940, 20: 287.

It is evident that the trend in renal surgery has for some time been directed toward conservation and minimizing of the morbidity and later complications. Perfection of technique has reduced the mortality rate of renal surgery to a level comparable to kindred operations on other major organs of the human body. Development and perfection of diagnostic methods in urology, which not only enable accurate diagnosis to be made, but often dictate the operative indications and possibilities, have aided materially in this transition.

A variety of surgical procedures on the kidney have been presented and discussed, perhaps all too briefly. Many of them are time-honored while others are still of debatable value. In conclusion, the authors would emphasize that any specialistic surgical procedure that has a limited application and intricate technique must, of necessity, suffer when employed universally and indiscriminately. Such has been, and probably will be, the fate of nephropexy, pyeloplasty, and renal denervation. These procedures have a specific application, and only in the hands of the surgeon equipped with diagnostic acumen, technical skill, and a thorough knowledge of urological anatomy and physiology will they receive due and proper recognition. D. E. MURRAY, M.D.

Palecsko, I.: Prolapse of the Ureter (Ueber den Harnleitervorfall). *Arb. chir. Klin. Univ. Pécs*, 1939, p. 103.

Urethrocele is the cystic dilatation of the ureteral opening. In the days before the use of the cystoscope this condition was observed only during autopsies; the great value of cystoscopic examination is therefore quite apparent. An exception to this was the rare case which occurred in women in whom the cystic dilatation was of such a high grade that after passing the bladder and the short female urethra it prolapsed in front of the vulva.

The cystic dilatation appears to protrude into the bladder at the point where the ureters open into this organ. When this widened portion contains urine it becomes distended and can easily be compressed by the ureteral catheter; its pinkish translucency may be enhanced by approaching it with the lamp of the cystoscope. If we observe this cyst for a longer period of time we can determine that it fills itself with the urine coursing through the ureter, somewhat like a rubber tube. This cystic dilatation then empties itself through the ureteral opening, whereupon the cyst walls again collapse. This process of filling, becoming completely full, and emptying proceeds in a rhythmic manner. The filling of this cyst-like dilatation may become so extreme that the internal orifice, indeed even the opening of the other ureter, may become closed off as if by a valve.

Histologically these cysts consist of three layers; ureteral mucous membrane, bladder mucous membrane, and between these a connective tissue of varying development, shot through here and there with muscle and elastic fibers. The ages of the patients range from twenty to forty years. The ratio of females to males is 3:1.

The primary cause in the genesis of this condition seems to lie in a congenital defective development of the bladder and ureteral musculature. Some authors regard congenital or acquired obstructions at the bladder end of the ureter as the cause; others believe it to be congenital narrowing of the ureteral orifice.

The symptoms are not at all characteristic, and frequently the condition may run a symptomless course. In the case of vague complaints cystoscopy alone may bring about clarification. Serious complaints ordinarily first make their appearance when the cyst has reached a considerable size. In the early stages the urethrocele has no effect upon the kidney; it is only when the obstruction becomes severe or when the ureter becomes completely closed off that stagnation in the portion above the stenosed part takes place, i.e., in general the complaints increase with the severity of the process. However, the objective findings and the subjective complaints are not always in direct relationship with each other. The diagnosis rests upon the cystoscopy. In addition to this the kidney on the side of the prolapse should be examined as to its anatomical intactness, its behavior, and function, even in cases in which the urine is clear and the patient is free from complaints.

From the standpoint of the differential diagnosis of ureteral prolapse, tumors and inverted bladder diverticula are to be kept in mind. The prognosis is favorable if the condition has been discovered early and no retrograde changes exist; in these cases true restitution may be accomplished by the removal of the cystically dilated end of the ureter. Should the disease remain undiscovered it may become extremely dangerous to the patient. If the urethrocele is first discovered when secondary changes have already developed in the kidney, the prognosis then depends upon the extent to which the retrograde changes of the kidneys have advanced and whether an infection is present.

An operative procedure can be avoided only in those cases in which the urine is excreted in sufficient amounts from the kidney. Treatment can be only operative, and the approach can be made either through the endovesical or transvesical route. The endovesical approach is accomplished by means of electrocoagulation which is done with the high-frequency current. This procedure has abolished all other forms of treatment used until now. In the presence of bilateral urethrocele both sides should not be coagulated simultaneously.

The high bladder incision should be chosen for the transvesical operation. After the bladder has been opened the urethrocele is opened dorsally; the collapsed cyst walls may then be removed.

The urethrocele becomes dangerous because of the fact that its existence produces no typical complaints; the condition often develops slowly and latently and thereby endangers the patient's life. The importance of cystoscopy cannot be sufficiently stressed, not only in those cases in which the cause of the bladder symptoms, pus and blood in the urine, is not clear, but also in those cases in which in the presence of bladder complaints the urine is free from pus or other elements, as in these cases also a urethrocele may be present.

(E. Illés). Harry A. Salzmann, M.D.

Hyams, J. A.: Surgical Disorders of the Ureter. *Surg. Clin. North Am.*, 1940, 20: 323.

Because of its strategic position between two such important organs as the kidney and bladder, which are so frequently the seat of major disturbances, the importance of changes in the ureter cannot be underestimated. Any intrinsic or extrinsic obstruction of it may result in destruction of the kidney. It may be the primary site of pathological change, or it may participate in disease of either the kidney or bladder because of direct extension of this disease.

The significance of early diagnosis and institution of appropriate treatment is therefore apparent. In all conditions of the upper urinary tract or in obscure abdominal disorders, the possibility of the ureter as a causative factor should not be overlooked. With proper use and interpretation of modern diagnostic methods, the exact location and extent of the pathology can be ascertained pre-operatively and the proper corrective measures applied, as adapted to the individual case. The majority of ureteral disorders are amenable to surgical treatment and their early correction may conserve and restore renal function. It may be impossible to foretell the reserve capacity of a kidney when its ureter is blocked, but the remarkable recuperative power of the kidney should be given full consideration.

The author presents more common disorders of the ureter and the particular type of surgical procedure he considers best adapted to their surgical correction.

D. E. Murray, M.D.

Brackin, R. E.: A New Method of Uretero-Intestinal Anastomosis Utilizing Peritoneum. *Arch. Surg.*, 1940, 40: 658.

The author presents a new method of uretero-intestinal anastomosis in which the intact parietal peritoneum overlying the ureter is included in a lateral submucous uretero-intestinal anastomosis. A necrosing suture is utilized to establish the uretero-intestinal opening.

The formation of a uretero-intestinal fistula is soon effected because of the presence of infection in the tissue under the necrosing suture. The edema in the surrounding peritoneum increases the tension of the necrosing suture and hastens breaking down of the tissue. Growth of epithelium then completes the production of a uretero-intestinal anastomosis.

A necrosing suture has been employed by the author in 52 consecutive implantations of the ureter into the colon in animals. After every transplantation the suture caused tissue necrosis which resulted in a ureterosigmoidal anastomosis. There is no tension on the ureter after this procedure; presumably in clinical application tension would be no greater than after the retroperitoneal implantation employed by Cabot. The chief factors contributing to the good results obtained with the method described are a ureter normal down to the uretero-intestinal opening and an epithelized opening into the intestine which is characterized by the absence of scar tissue.

The incidence of hydronephrosis and pyelonephrosis subsequent to implantation of the ureters into the colon has been reduced experimentally by a method which involves utilization of peritoneum and in which dissection of or trauma to the ureter does not occur. D. E. MURRAY, M.D.

BLADDER, URETHRA, AND PENIS

Mathé, C. P.: The Management of Intractable Cystitis Associated with Vesical Fistula and Osteomyelitis of the Pelvic Girdle: Report of 3 Cases Following Traumatic Rupture of the Bladder and Fractured Pelvis. *J. Urol.*, 1940, 43: 543.

Three cases of long-standing intractable cystitis secondary to chronic osteomyelitis of the pubic bone, a late complication of fracture of the pelvis and rupture of the bladder, are reported. All 3 patients were relieved by operation.

Three types of chronic cystitis are observed: (a) that resulting from traumatic rupture of the bladder, associated with fracture of the pelvis, or luxation of the pelvic bones; (b) that due to osteomyelitis of the symphysis and rami of the pubis occurring after operations on the bladder or to osteomyelitis of the pelvic girdle following operations on its component bones; and (c) cystitis due to non-tuberculous, hematogenous osteomyelitis of the pubis and thigh, usually occurring during childhood.

Chronic urinary infection which is associated with hematogenous and traumatic osteomyelitis of the pelvic girdle is due to complicating infected sequestra or involucra, abscesses, spontaneous rupture of the bladder, or osteovesical fistulas.

The diagnosis should be suspected in patients presenting chronic pyuria in which there is a history of previous fracture of the pelvis or attacks of osteomyelitis in childhood. Rectal and vaginal palpation enables one to detect areas of distention in the bones making up the pubic arch, due to sequestra, abscesses, or fistulous tracts. Cystoscopic examination enables one to visualize migratory bone fragments and sequestra, associated stones, and the opening of fistulous tracts. Roentgen examination of the pelvic girdle demonstrates areas of rarefication, and fraying of the bone margin due to osteomyelitis and periostitis. Cystograms show bladder distortion, displacement, and communicating osteovesical fistulas.

Prophylactic treatment consists of hermetic diversion of the urinary stream by suture of the bladder wall to the skin at the time of the original surgical intervention for bladder rupture. Surgical treatment consists of sequestrectomy, curettage of the infected bone, débridement of infected surrounding tissues, removal of connecting fistulous tracts, and drainage of contiguous abscesses in conjunction with cystotomy or catheter drainage.

An extensive review of the literature reveals very few reports on the clinical entity of chronic cystitis resulting from traumatic and hematogenous osteomyelitis of the pelvic girdle, associated with sequestra, abscess formation, osteovesical fistulas, and urinary calculi. A plea is made for greater co-operation between the general surgeon, orthopedist, and urologist in order to stimulate more general recognition of this entity. D. E. MURRAY, M.D.

Arezzi, G.: Report of a Radical Cure of Exstrophy of the Bladder by Transplantation of the Ureters into the Sigmoid and Removal of the Bladder (Contributo clinico alla cura radicale della estrofia vescicale, mediante innesto degli ureteri nel sigma e cistectomia. Risultato a distanza). *Arch. ital. di urol.*, 1939, 16: 384.

The author reviews theories of pathogenesis and methods of treatment of exstrophy of the bladder, with special emphasis upon the work of Coffey, Mayo, Hinman, Higgins, and Kirwin. He reports the case of a twenty-two-year-old male whose left ureter was transplanted into the sigmoid bowel in 1931 by the first method of Coffey. No data are available on the condition of the patient before or after the operation, but it is known from the patient himself that the postoperative course was characterized by severe chills and a high fever, with pain in the region of the left kidney which gradually subsided and disappeared entirely, however, only after three years.

He re-entered the hospital in 1937, six years after the first operation. Phenolsulfonephthalein was found at that time to be eliminated more slowly on the transplanted side than on the right, and an intravenous pyelogram showed a diminution of function on the left with marked stasis on both sides. The patient had three or four bowel movements daily, the material being frequently urine alone. Laparotomy was again performed in January, 1938, and the second ureter transplanted into the sigmoid. In this procedure the incision was carried only through the serosa and muscularis of the bowel and the ureter buried in these layers for a distance of 1 or 2 cm., the end being attached by a suture which penetrated the mucosa and included a rubber tube which had previously been introduced into the sigmoid. On the fifth day the tube was taken out and the urine was found to flow from the newly transplanted ureter. The postoperative course was afebrile. In February of the same year the bladder was removed. Subsequent studies showed no back flow of urine in the transplanted ureters, but there was general dilatation of the left ureter and pelvis with some increase of the previously existing dilatation on the right side. Examinations were repeated in May, 1939, at which time it was found that renal function had been maintained, and that the patient was able to carry on part of his normal activities. He urinated three or four times per rectum during the day and several times at night.

In discussing this case, Arezzi stresses the advisability of transplanting the two ureters separately. He particularly defends the intraperitoneal route and points out the ability of the peritoneum to defeat infection. In evaluating the procedure as

a successful method of dealing with the problem of exstrophy he believes that although the ultimate prognosis of such cases is necessarily guarded, the absence of complications and the maintenance of an already impaired renal function in the reported case suggest that it is of definite value.

EDITH FARNSWORTH, M.D.

McCown, P. E.: Carcinoma in Exstrophy of the Bladder. *J. Urol.*, 1940, 43: 533.

A review of the literature of carcinoma in exstrophy of the bladder reveals 24 reported cases. The author presents another case and the surgical procedures employed.

The author is led to believe from the autopsies reported that carcinoma in exstrophy of the bladder does not metastasize as early as in the normally placed bladder, and he draws attention to the fact that more close attention should be paid to the prevention of infection in the upper urinary tract.

D. E. MURRAY, M.D.

Gayet, R.: Leiomyosarcoma of the Bladder (Les léio-myo-sarcomes de la vessie). *J. d'urol. méd. et chir.*, 1939–1940, 48: 320.

The author reports 3 cases of leiomyosarcoma of the bladder in which the tumors were surgically removed. The first patient died a few days after operation of an ascending infection, and the two others after six weeks and three and one-half months, respectively, with evidence of recurrence in spite of irradiation.

The author directs attention to the apparent rarity of this neoplasm as only 18 cases including his own have been reported in the literature. However, he is convinced that it occurs more commonly than is generally realized. It appears predominantly in the male between the ages of forty and sixty years.

The author discusses the possibility of the development of these tumors on the basis of malignant degeneration of a pre-existing benign leiomyoma. They may be classified into three types, depending upon their relationship to the bladder wall: (1) interstitial or intramural, which is the rarest, (2) submucosal, and (3) peripheral or excentric, which is the most frequent. They arise most commonly at the trigone and grow to varying sizes, some weighing as much as 3 lb. Grossly they resemble uterine fibroids and may be pedicled or sessile. Whereas they rarely invade neighboring structures, they characteristically produce metastatic infiltration of the bladder wall. Microscopically they are characterized by large myoblasts, undifferentiated round cells of connective-tissue origin, and numerous mitotic figures.

In addition to the common clinical manifestations of malignant tumors of the bladder these patients complain of pollakiuria, marked dysuria, and hematuria. The urine is foul, thick, and contains blood clots and even particles of the tumor. Bimanual palpation usually reveals the tumor. The condition progresses rapidly and soon leads to cachexia. Although the diagnosis may be suspected it can be made with certainty only by biopsy and microscopic examination.

The various methods of therapy are critically evaluated. The author is of the opinion that irradiation therapy is of little value. Theoretically total cystectomy is the procedure of choice but its practicability is doubtful, according to the author, because of the highly malignant and progressive character of the condition.

MICHAEL DEBAKEY, M.D.

GENITAL ORGANS

Lowsley, O. S.: Prostatectomy: Perineal, Suprapubic, and Transurethral. *Surg. Clin. North Am.*, 1940, 20: 351.

The theories of the cause, the pathology, and the different methods of treatment of prostatic hypertrophy are reviewed. The author concludes it is undoubtedly a fact that perineal, suprapubic, and transurethral prostatectomy each has its place in urological surgery. The operation to be done depends upon the conditions found. The surgeon should be psychologically and technically equipped to perform the operation most suitable to the case in question. By limiting his surgery to one method only, the operator limits his usefulness to his patients.

It is recommended that prostates enlarged to a great degree intravesically be removed by the suprapubic route. Those greatly enlarged, which encroach upon the urethra and the vesical orifice and which do not have a great degree of intravesical intrusion, should be removed by the perineal route. Prostates with enlarged middle lobes, enlargements of the subcervical group, fibrous bars, and certain cases of malignancy are best removed by transurethral resection.

D. E. MURRAY, M.D.

Duhanov, A. J.: Ectopia of the Testes in Children with Special Attention to Indications for Operative Procedures. *Vestnik khir.*, 1939, 58: 558.

Observations on 35 patients with ectopic testes induced the author to accept the theory of dysfunction of the endocrine apparatus as the most plausible explanation of the etiopathogenesis of this condition.

The most common form of ectopia is the inguinal. If not complicated, this form does not exert any untoward effect on the function of the organ. None of the complications, such as trauma, incarceration, torsion of the spermatic cord, or malignant degeneration, is frequent enough to justify an operation in each case of undescended testes.

Ectopia is usually accompanied by a patent vaginal process, but clinically detectable inguinal hernia develops only in a very few patients, and in such cases it is the rupture and not the ectopia which requires an operation.

Orchiopexy as such does not produce a considerable stimulating effect on the development of the testis in an overwhelming majority of the cases. As a matter of fact, the excessive tension on the sper-

matic cord, resulting from the operation, may lead to a marked atrophy of the testicle.

In the majority of cases a spontaneous descent of the ectopic testis takes place. This occurs, contrary to the widespread opinion, not infrequently in the second decade of life. After such a spontaneous descent, small, apparently atrophic organs reach within a short time a normal size.

Only serious subjective complaints, such as pains appearing in the form of attacks, are considered by the author as the main indication for orchiopexy. If the subjective symptoms are slight or absent, hormonal therapy is indicated.

JOSEPH K. NARAT, M.D.

MISCELLANEOUS

Roth, L. J.: Sulfanilyl-Sulfanilamide (Disulon) vs. Sulfanilamide in the Treatment of Acute Gonorrhea in the Male. *J. Urol.*, 1940, 43: 483.

A clinical study of the effect of disulon in gonococcic infections in the male was made and the results compared with those obtained when sulfanilamide was used. In the Out-Patient Department 47 per cent of the 44 cases of acute gonorrhea treated with sulfanilamide showed cures in two weeks or less, whereas 73 per cent of 22 cases of acute gonorrhea treated with sulfanilyl-sulfanilamide showed cure.

Of 42 private cases of acute gonorrhea treated with sulfanilamide, plus acriflavine and potassium-permanganate irrigations, 71 per cent were cured within two weeks or less, and of 29 private cases of acute gonorrhea treated with sulfanilyl-sulfanilamide plus daily irrigations of acriflavine and potassium-permanganate, 92 per cent were cured within two weeks or less.

Twelve cases which did not respond to sulfanilamide were successfully cured with sulfanilyl-sulfanilamide.

The dosage of sulfanilamide never was more than 45 gr. a day. The dosage of sulfanilyl-sulfanilamide was 45 gr. in the Out-Patient Department and in the treatment of private patients 45 gr. the first two days and 30 gr. daily thereafter. Neither drug was given more than two weeks.

The author believes that sulfanilyl-sulfanilamide is superior to sulfanilamide in attacking the gonococcus.

When response to either sulfanilamide or sulfanilyl-sulfanilamide is not immediate, clinical cure is prolonged by from four to six weeks, and it may be wise to discontinue chemotherapy for other methods of treatment to prevent unnecessary toxic effects due to the prolonged administration of the drugs.

The reactions from sulfanilyl-sulfanilamide (25 per cent) were much fewer than those from sulfanilamide (60 per cent). D. E. MURRAY, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Levander, G.: An Experimental Study of the Rôle of the Bone Marrow in Bone Regeneration. *Acta chirurg. Scand.*, 1940, 83: 545.

Most of the information in the literature concerning the bone-forming activity of bone marrow can be relegated to the sphere of hypothetical obscurities. Data founded on exact observations and giving the possibility of drawing definite conclusions are still scantier. The question of what the causal factors are in the production of bone is still unanswered.

In seeking further knowledge about the tissue reactions associated with a fracture the author has conducted two sets of experiments by grafting bone marrow into soft tissues. One series was done on full-grown animals during a relatively long period of observation to find the maximum productive capacity of bone marrow as a bone regenerator. Twelve experiments were done. The period of observation varied between fourteen and fifty-eight days. In 5 instances bone formation was obtained.

In the second series the study was directed to the histogenesis of the newly formed bone. Young animals were used and the period of observation was between two and eleven days. Morphological analysis of the tissue reactions showed that the bone-marrow cells died. The new bone arises from mesenchymal tissue formed around the graft. In the author's opinion there are no pre-existing osteoblasts in the bone marrow. He maintains that the marrow stimulates bone formation through some inherent substance possessing the power of so influencing the non-specific mesenchymal tissue as to cause bone to form. ROBERT P. MONTGOMERY, M.D.

Bosworth, D. M.: An Analysis of 28 Consecutive Cases of Incapacitating Shoulder Lesions Radically Explored and Repaired. *J. Bone & Joint Surg.*, 1940, 22: 369.

The author presents a series of cases of incapacitating shoulder lesions. Attention is directed particularly to the correlation of the symptoms, the roentgenographic appearances, and the pathology which was found. Since radical exploration was done in all the cases to avoid the overlooking of any gross pathology, the author believes that some report of the results is necessary to justify the extensiveness of the procedure used for inspection of the joint. No deaths, infections, or major catastrophes were encountered, and, except for those cases representing complete avulsion of the short-rotator cuff or musculotendinous separation, improvement in the preoperative condition was uniformly obtained.

Photomicrographs, detailed drawings of the pathology found at operation, the operative procedures, and roentgenograms are presented.

The 28 cases are grouped into four classes as follows:

I. Pathology not found; 1 case
II. Tendon lesions
  A. Complete avulsion of the short-rotator cuff (tendons of the supraspinatus, infraspinatus, teres minor, and subscapularis); 4 cases.
  B. Laceration or avulsion of one or more short-rotator tendons in their substance or at their attachments; 17 cases.
    1. Recent avulsion
      a. Of deep or superficial surface at insertion; 4 cases.
      b. Of entire thickness of tendon
        (1) Anterior portion of supraspinatus tendon; 4 cases.
        (2) Complete tendon or tendons; 4 cases.
        c. With horizontal split; 1 case.
        d. With fibrillation or fimbriation; 1 case.
        e. Of cortical fragment at supraspinatus insertion; 1 case.
    2. Old avulsion (crescentic type); 2 cases.
  C. Musculotendinous separation of the supraspinatus and the infraspinatus; 1 case.
  D. Calcification or ossification of the supraspinatus tendon (plus surrounding calcification and degeneration); 2 cases.
III. Bursal lesions
  A. Obliterative subacromial bursitis (frozen shoulder); 2 cases.
  B. Laceration of the bursal floor without tendinous involvement; 1 case.
IV. Exostoses
  A. Sharp exostosis at the tendinous attachment of the greater tuberosity without other pathology; 1 case.
  B. Rounded exostosis on the greater tuberosity associated with tendon laceration; 1 case.

Although this classification is rather extensive for a small series of cases, it is necessary as the type of repair differed for each group.

Because of the gross appearance of degeneration of lacerated tendon extremities, the extensiveness of tendon-insertion injuries, and the necessity of repairing split-tendon defects of the short rotators of the shoulder joint, it was found necessary to develop some method of mobilizing the attachment of the supraspinatus and the infraspinatus tendons sufficiently to allow their transplantation downward on the humerus. It was found that, following division of the anterior border of the supraspinatus tendon and the posterior border of the infraspinatus tendon from the rest of the short-rotator cuff, these two tendons could be easily retracted from 1 to 1½ in. downward beyond their usual position. Since these incisions left a wedge-shaped tendon, it was noted

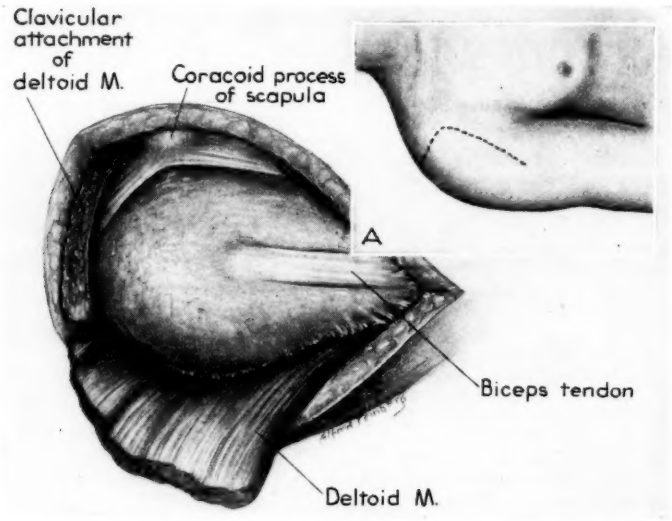

Fig. 1. The deltoid, freed from the pectoralis major and its acromioclavicular attachment, is turned back and downward. The bursal roof is exposed. *A:* Skin incision.

that on downward retraction the gap formed in the short-rotator cuff by the release afforded by the incisions was again filled by the wedge-shaped supraspinatus and infraspinatus tendons as they were retracted downward. It was also noted that downward retraction of these tendons for approximately 1 in. did not increase their tension on the muscles beyond that expected from normal muscle tone. Hence it only remained to cut a wedge-shaped area from the greater tuberosity of the same depth as the tendon substance and to fasten the tendons in place. This repair removes the distal portion of the tendons from the active mobile portion of the joint, together with any degenerative or other lesion localized in the distal inch of the tendon substance. The bursal floor, if previously lacerated, will have been replaced with that attached to the upper surface of the retracted tendons. This procedure has been carried out in 8 cases since June, 1938. The speed of recovery has been much greater than in the previous simple suture of the tendon end to the tuberosity. It is too recent a procedure to report the true end-results.

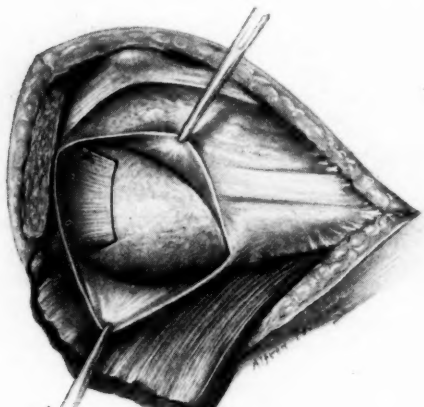

Fig. 2. The bursal roof has been opened vertically, and the line of incision of the attachment of the supraspinatus and the infraspinatus tendons is indicated. The incisions at *A* and *B* extend upward along the anterior and posterior borders of these tendons, freeing them from the rest of the tendinous cuff and allowing their mobilization.

Thorough inspection of the shoulder joint and complete and satisfactory repair of any gross lesion demand wide exposure. The division of the deltoid fibers described leaves no permanent clinical defect.

The chief importance of the deep surface lesion lies in the fact that it is so well hidden. When the bursa is opened, the top surface of the tendon, which is still intact, may appear slightly yellowish or unchanged. Unless one dissects under the anterior edge of the supraspinatus tendon, the basic pathological change will be missed and the patient will not be benefited by operation. By passing a curved instrument through a small slit at the anterior edge of the supraspinatus tendon, and by palpation of a finger above the point of the curved instrument as it

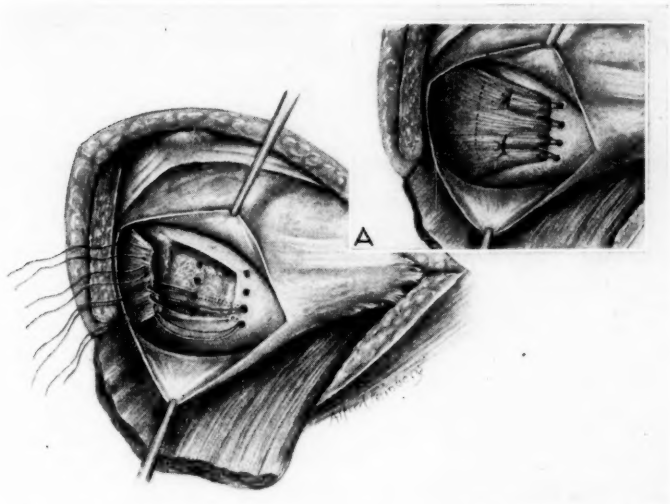

Fig. 3. The two posterior mattress sutures have been led through the cortical drill holes from without inward, upward through the cancellous bone in the floor of the defect, and thence upward through the tendon, emerging on its superficial surface about ¾ in. proximal to its free cut margin.

A: All four sutures have been passed as described and are tied across the tendon in pairs. The tendon is drawn tightly into the defect longitudinally and is bound down by the method of suture in close apposition with the floor of the defect. Note that the bursal floor on the superficial surface of the tendon has filled the defect caused by removal of the tuberosity area and that the distal inch or more of tendon has been removed from the actual mobile portion of the joint. The bursal roof remains intact ready for suture.

passes along the tendon, one can examine the tendon structure and attachment. Any irregularity or thinning of the tendon is then easily and definitely demonstrable. Diagnosis of suspected short-rotator-tendon laceration has been exceptionally accurate, but the lesion itself may be hidden and its demonstration may require more complete exploration than simple bursal incision. Moderate delay of operative interference in suspected acute ruptures does not prejudice the final outcome and is justifiable. Calcified shadows in the short-rotator tendons may actually be osseous in formation and, therefore, impossible of removal by conservative means. Lacerations of the supraspinatus and the infraspinatus tendons show no gross or microscopic evidence of repair or of fibrosis, but they do show progressive degenerative changes with associated fibrotic lesions in the subacromial bursa and about the subscapularis tendon. Old crescentic lesions are the result of "tear and wear" and not of "wear and tear." Laceration of these tendons may be expected to cause progressive degeneration and increasing symptoms.

Recent avulsions of one or both of these tendons are the "typical cases" and show most if not all the clinical requirements demanded by Codman for rupture of the supraspinatus tendon. It is noteworthy that they constitute less than one-third of all lacerations of the tendons of the short-rotators although the other lesions may be equally disabling so far as active laborious occupation is concerned. A new subacromial-bursa formation may occur after complete obliteration following sharp dissection, replacement of the mobile elements at their highest functional point, and gradual lowering after healing. There is apparently a drawing-out of new bursal lining from the portion of the bursa remaining under the acromion process. Repair of complete avulsion of the short-rotator cuff is unsatisfactory, and primary shoulder fusion is indicated, especially when a complete axillary nerve lesion is present.

The new operative procedure described was used in 1 case for a musculotendinous separation of the supraspinatus and infraspinatus. It was not successful because the lesion could not be removed from the site of the actual mobile portion of the joint and a shoulder fusion may be required in this instance.

ROBERT P. MONTGOMERY, M.D.

Pacini, D.: The Pathogenesis of Essential Epiphysitis of the Neck of the Femur (Sulla patogenesi dell'epifisiolisi essenziale del collo femorale). *Chir. d. organi di movimento*, 1939, 25: 245.

The roentgenograms and case histories of 10 cases are presented, the literature is briefly reviewed, and

various hypotheses concerning the etiology are considered. The author concludes that:

1. The pathogenesis of the epiphysitis remains an unsolved problem. The most accredited and plausible theories, namely, the vascular and infective, do not seem to correspond with proved facts.

2. Endocrine alterations are often associated, but not with a constancy that would make them significant.

3. The condition has a rather long course, about one and one-half or two years, and it is difficult to establish, even in the phase of separation, the functional importance of weight-bearing on the joint.

4. The epiphyseal line often disappears earlier on the side of the lesion than on the healthy side.

5. The best treatment is the closed reduction of Lorenz-Whitman. The result of the treatment is dependent upon the phase of the disease in which it is initiated.

6. Cervico-epiphyseal nailing of the reduced separation does not accelerate the course of the malady nor shorten the period of immobilization.

FRANK MCDOWELL, M.D.

Jack, E. A.: The Etiology of Hallux Rigidus. *Brit. J. Surg.*, 1940, 27: 492.

The author studied a series of 22 cases of hallux rigidus occurring in 15 patients in an attempt to evaluate the possible etiological factors. He finds that in practically every case there is evidence of an incompetent first metatarsal segment and that the condition of hallux rigidus precedes or is coincident with the early stages of pes planus. The belief is expressed that the arthritic changes which develop are the result of multiple, repeated minor traumas to the first metatarsophalangeal joint; these occur during the propulsion stage of the gait when the incompetent first metatarsal segment fails to carry its normal load in walking. DANIEL H. LEVINTHAL, M.D.

Thorndike, A., Jr.: Myositis Ossificans Traumatica. *J. Bone & Joint Surg.*, 1940, 22: 315.

"Myositis ossificans traumatica" is an inflammatory process of muscle in its early stages before ossification can be demonstrated by roentgenograms. The myositis is most apparent during the first two weeks following injury. The muscles involved in the contusion are swollen and extremely tender during this stage and the loss of function is extraordinary. The classical signs of "tumor," "dolor," and "calor" are all present. The author believes that there are signs of muscle inflammation in the early stages of development of a true "myositis ossificans," and that, as ossification takes place later, the inflammation subsides and eventually disappears when the muscle function returns to normal.

The sequence of pathological changes is a severe deep-muscle contusion, accompanied by the tearing of muscle fibers and capillaries, and the loosening of periosteal cells; and hemorrhage, with the accompanying inflammatory reaction that one would expect in hematoma formation and hematoma absorption, in which stage the ossification takes place. The latter occurs during the healing stage and not during the acute hemorrhagic and inflammatory stage. The late stages of ossification show definite normal cancellous bone.

The criteria for absorption of the ossifications are size, location, and individual diathesis. The smaller ossifications are absorbed, and those on the upper extremity, except those near the elbow joint, seem to have a greater ability to disappear completely. Those occurring in the belly of a muscle become dormant and painless, and clinically the muscle involved is restored to normal function, even in the most severe cases when regression is incomplete. The myositis heals and normal muscle function ensues, although the ossification may not be entirely absorbed. An ossification which occurs at the origin or the insertion of a muscle near a joint, however, may regress and become dormant, but the muscle and joint function is never restored to normal.

The diagnosis of myositis ossificans is clear-cut and apparent. A muscle contusion, receiving the usual careful physical therapy, in the course of four or five days does not seem to respond properly to treatment. The muscle involved becomes more acutely tender, more firm and hot, and loses function. The striking feature is that the muscles involved in the contusion become more acutely sensitive to ordinary light massage. All such treatment should cease promptly. Any friction over the contusion, even that from clothing, should be prevented. This stage is that of acute inflammation, "acute myositis." The treatment should be rest and heat, with elevation of the inflamed part. The stage of ossification does not become discernible until between the sixteenth and the twenty-first days, and then only with the aid of the roentgen rays. The inflammatory reaction subsides gradually in a few days, and then limited motion, up to the point of pain, can be permitted, and, instead of complete rest, gradual ambulation and motion are started. Heat, however, should be applied daily and regularly, until the muscle function has been restored. As the ossification commences its absorption or regression, the inflammatory myositis subsides, and normal function is restored to the muscle. At this point, it is safe to permit the patient to resume normal activities, even to allow body-contact sport, provided the original site of injury is properly protected from further contusion. Repeated trauma to this site of injury results in increased ossification of the area and a prolonged period of convalescence.

Preventive measures are proper padding in sports and control of hemorrhage by the application of cold for one hour and the use of a compression bandage with a sponge rubber. The third point is the ruling out of massage in the early treatment of all deep-muscle contusions. Greater areas of ossification have been produced by overenergetic massage in the early treatment of ordinary muscle contusions. It is a far safer rule never to apply massage directly to the area of tenderness in a muscle contusion.

Operative removal of the ossification is contraindicated in any case in which it occurs in the belly of a muscle or on the shaft of a bone. Only in those cases in which it occurs at the origin or the insertion of a muscle or tendon, and in which the adjacent joint function is markedly impaired, is operation indicated, and then only after the process has become entirely dormant, from twelve to twenty-four months after the injury. Recurrence of the original myositis ossificans in even greater magnitude than that of the first instance will most certainly ensue if early operative measures are instituted.

Evacuation of the hematoma in the early stages of its formation is contraindicated. To accomplish this completely in deep-muscle contusions requires careful surgery, necessitating further trauma and hemorrhage in dissection and suture, and tissue repair later, before active motion and function of the injured muscles can be started. The restoration of normal function following surgical evacuation of a deep-muscle hemorrhage is unduly prolonged. Since evacuation of a hematoma, other than a superficial one by a needle puncture, is incomplete, the hazards are too great. Furthermore, the danger of spreading wider the loosened periosteal cells by either surgical or needle-puncture evacuation is real. The aim of treatment should be to control the hemorrhage early by the application of cold and a compression bandage, and to minimize the size of the hematoma in so far as is possible by conservative measures only.

The bone most frequently involved in the author's series of 25 cases was the femur. Roentgenograms and summary charts are presented.

ROBERT P. MONTGOMERY, M.D.

Culp, O. S.: The Treatment of Gonorrheal Arthritis. An Analysis of 200 Cases. *J. Urol.*, 1940, 43: 737.

Two hundred patients with gonorrheal arthritis were studied. Thirteen different forms of therapy were used. Sulfanilamide, intravenous mercurochrome, and fever therapy gave the best results. Twenty-seven patients were treated by intravenous injections of 1 per cent mercurochrome and 69 per cent of them were discharged as well or markedly improved. Generally three or four doses of from 10 to 30 c.cm. were sufficient. A sharp rise in the temperature following an injection is an indication of the success of the treatment. Twenty-two patients were treated with sulfanilamide and 68 per cent were cured or markedly improved. The results appeared to be particularly good in the acute cases. The drug should be given in doses of 1.2 gm. with sodium bicarbonate every six hours until the blood concentration is 8 mgm. per 100 c.cm. It should not be continued longer than two weeks and frequent careful studies of the blood are advisable. Nineteen patients were treated by fever therapy with good results in 53 per cent. Severe reactions and 1 death occurred. Marked improvement or cure was obtained in 9 with one or two treatments.

CHESTER C. GUY, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Blount, W. P.: Osteoclasis for Supination Deformities in Children. *J. Bone & Joint Surg.*, 1940, 22: 300.

Supination deformities of the forearm occur following flaccid paralysis in the lower-arm type of brachial palsy, poliomyelitis, and in fractures, especially when there is bowing of both bones in the middle third, angulation of both bones with the apices toward the interosseous space, and, in general, following open reductions when compared with closed reductions.

Persistent supination of the forearm renders ineffective an otherwise useful hand and it is objectionable cosmetically. These deformities resist correction by plastic operations of the soft tissues. Osteoclasis in the middle third of the forearm corrects this deformity in children. The bones of the forearm in paralysis are of delicate structure; there is osteoporosis, the cortices are thin, and the bones are small. The radius is usually bowed laterally and the ulna dorsally.

The author presents a summary chart of 9 patients in which 11 osteoclases were done. In all but 1 case complete fracture of both bones of the forearm was easily accomplished. The technique is as follows:

The affected arm is placed in abduction and external rotation, so that the wrist is near the shoulder. The forearm is as near midpronation as obtainable, with the dorsum toward the table. In this position, no important soft structures lie between the bones and a padded sharp wedge. The surgeon should stand on a bench with his hands grasping the forearm on either side of the wedge. With a quick straight-arm thrust, the bones are fractured, usually incompletely. It is then necessary to reverse the force, manually breaking the bones entirely through. It is advisable to bend them back and forth several times to ensure complete fracture. The forearm can then be pronated between 45 and 90° and is fixed in this position by a plaster cast, which extends from the axilla to the knuckles, with the elbow in flexion.

If correction is incomplete, it may be advisable to obtain further pronation under anesthesia from two to three weeks later. It is sometimes necessary to apply a second cast. Six to eight weeks of fixation are required in older children and all possible pronation correction up to 90° should be maintained. Gradual partial recurrence of the deformity will take place. Following osteoclasis an increase rather than a diminution of the range of motion is frequently obtained and this motion is through a more useful arc; and the cosmetic appearance is improved.

Photographs and roentgenograms are presented.

ROBERT P. MONTGOMERY, M.D.

Pollidori, A.: Results of the Surgical Treatment of Bone Cysts (Esiti della cura chirurgica delle cisti ossee). *Chir. d. organi di movimento*, 1939, 25: 213.

Forty-four cases of bone cysts are reported from the clinic at Bologna. Seventeen of these healed fol-

lowing fractures and immobilization, and the remainder were the subjects of surgical intervention. After 27 operations there were 4 recurrences. In 8 of the operations, grafts were used from the tibia or fibula and in this group there was 1 recurrence. In 16 cases, the operation merely involved opening and emptying of the cyst, or opening and emptying of the cyst followed by filling of the cavity with fat or muscle, and in this group there were 3 recurrences. It is concluded that the difference in the results is not significant and that one can probably not formulate any generalizations from this series.

However, in studying the roentgenograms of the cases it was noted that there was considerable variation in the thickness of the wall separating the cyst from the medullary canal. In the small cysts, and also in a few of the larger ones, the medullary border was indicated only by a different tone of transparency or by a very slender line of condensation. In another group, composed mostly of the larger cysts, the cyst was demarcated from the medullary canal by a very thick line of condensation. All of the recurrences were in multilocular cysts belonging to this second group. In these recurrences, the bony proliferation which filled up the cavity presented a non-homogenous appearance in the roentgenogram and the fusion with the preformed bone appeared impeded or retarded. In 1 such case, after a reintervention which effected normal healing, the ossification of the cavity was homogenous with that of the surrounding bone. It is suggested that the operation should include the destruction of this wall between the cyst and the medullary canal and that a broad communication should be established.

FRANK MCDOWELL, M.D.

Stack, J. K., and Magnuson, P. B.: The Nicola Operation: An Analysis of Failures. *Quart. Bull., Northwestern Univ. Med. School,* 1940, 14: 108.

The Nicola operation, first reported in 1929, is essentially a transplantation of the long tendon of the biceps muscle through a drill hole in the head of the humerus, which makes it a "check rein" when the arm is abducted and extended. Since 1934, the authors have used this procedure 19 times for the correction of habitual dislocation of the shoulder. Their failures and those reported by others are analyzed. By a failure is meant: (1) any recurrence of the dislocation, (2) limitation of motion sufficient to impair the function of the shoulder, or (3) instability to the extent that the patient remains on guard against motions in abduction and extension.

In the ten years following Nicola's introductory paper, 19 articles dealing specifically with this operation have appeared in the literature, and 138 cases in which it was done have been reported. Eighteen of these operations (13 per cent) were considered failures principally because of redislocation. If Nicola's 58 cases (with 3 failures, or 5 per cent) are excluded, the end-results of Nicola operations performed by the other surgeons show a failure in 18 per cent (see Table I). Nine of the failures were re-operated upon and in 7 the cause of the failure was apparent. In discussing these causes, it is fair to state that in 3 instances the shoulder was subject to such trauma that no indictment of the operation can be made, as in each case the injury was considered sufficient to disrupt a properly done operation.

TABLE I.—ANALYSIS OF REPORTED NICOLA OPERATIONS

Author	Number	Failures	Re-operated cases	Cause of failure
Fenner (1931)	2	0		
Frejka (1935)	5	0	0	
Hobart (1933)	3	1	0	
Horwitz and Davidson (1938)	20	3	1	Trauma, rupture of biceps tendon
Inclan (1935)	5	0		
Koster (1938)	3	0		
Stack and Magnuson (1939)	15	3	3	Trauma, rupture of biceps tendon Technical, tendon slack (?)—no cause found
Moseley (1935)	12	3	0	
Nicola (1939)				
a. personal	58	3	2	Technical, hole too large
b. reported		2	2	Technical, hole misplaced (?)—no cause found
Willard (1936)	10	2	0	
Wilson (1933)	5	1	1	Trauma, tearing of tendon suture one day after operation
Totals	138	18	9	

Reported failures not re-operated upon are not included in the chart and are not analyzed in the text.

The analysis of the remaining or technical failures places the responsibility for success of the operation on the biceps tendon: (1) its individual inherent strength, (2) its condition at the time of the operation, (3) the manner of its placement in the drill hole, or (4) the position of the arm at the time of the tendon suture and its fixation to the adjacent periosteum. The size and strength of the tendon may not be directly proportional to the size and strength of the arm, and in a given instance the tendon may not be strong enough to serve as an adequate suspensory ligament. This tendon, like the supraspinatus tendon, is subject to lesions of attrition, and the presence of such a gradual fraying process, the result of use as well as age, is a valid ground for the rejection of this procedure. Though Nicola's investigations of the tensile strength of the biceps tendon suggest that a normal tendon should be adequate to withstand any reasonable strain, the work of Norton, Mortenson, and Sullivan with the tendons of dogs tends to show that this actual strength is of importance only as it affects the portion of the tendon between the head of the humerus and the superior lip of the glenoid. Their studies indicate that after the tendon is placed

in the bony tunnel it is rapidly invaded and after from six to nine months is converted into fibrous tissue to the extent that its tendinous structure can no longer be identified. The rupture of this tissue within the bony tunnel was considered responsible for the failure of the reported case of Horwitz and Davidson.

Nicola claims that in order to secure the best results, the drill-hole in the humeral neck and head should emerge from the cartilaginous surface at least ½ in. from the lateral articular margin, and failure to conform to this rule was the cause of failure in some instances. Suturing the tendon and fixing it to the periosteum and the transverse humeral ligament with the arm at the side rather than in 90 degrees of abduction were considered responsible for the failure in 1 case. The size of the drill hole through which the tendon passes should be such as to admit it snugly, and 2 of the reported failures were due to the fraying caused by movement of the tendon within the tunnel. A contributory cause might also be the failure to remove the tendon sheath, which delays quick fixation within the tunnel.

The rapid acceptance of the Nicola operation may lead many surgeons to believe that this is the unequivocal answer to the problem of habitual dislocation of the shoulder, but in the hands of surgeons other than the originator, the Nicola operation failed to prevent recurrence of the dislocation in 18 per cent of the cases. If one adheres to the strict definition of failures mentioned previously, the number of unsuccessful results would be higher.

There is no question but that this method is a rational approach to the solution and one which the authors will continue to use, but they believe that many questions still remain to be answered. Since this problem deals principally with patients in their youth and early adult life, one must ask: "Will the transplanted tendon serve a lifetime?" If it will, can the tendon accomplish this without undergoing change? The failures reported are instructive and only by such dissection of the field previously operated upon, can one analyze and evaluate intelligently the results of this anatomical alteration.

F. Harold Downing, M.D.

FRACTURES AND DISLOCATIONS

Picot: Treatment of the Fractures of War (Traitement des fractures de guerre). *Mém. l'Acad. de chir.*, Par., 1940, 66: 155.

Picot points out that in fractures of modern warfare, there is great danger of infection, especially from gas gangrene; and that since such infection arises in the soft tissues, these tissues must be treated first. The injured tissues must be excised, projectiles and foreign bodies must be removed, the wound should be cleansed, and bleeding must be controlled. The author maintains that the use of casts, or any other method of fixation of the fracture that interferes with the circulation in these cases, should be abandoned. He has adopted the method of reduction of the fracture by suspension with a metal wire for exerting traction on the fragments and maintaining them in position. In connection with the use of this method he has devised simple apparatus for the suspension treatment of different types of fracture. The Thomas apparatus is used as far as possible for transporting cases of fracture of the femur to the hospital.

In the World War the author treated in one month (July, 1918) 437 patients with fracture by the suspension method; 400 of these were sent to the hospital directly from the field stations. Three patients were dead on arrival; 37 were sent in from neighboring hospitals. The 434 wounded had 490 fractures; there were 338 fractures of the thigh, 93 of the leg, 50 of the humerus, and 9 of the forearm. More than half of these soldiers had other wounds besides fracture. In all these cases from 20 to 40 c.cm. of anti-gas-gangrene serum were given according to the nature of the wound. Amputation was necessary in 17 cases because of irreparable destruction of tissue, in 6 cases because of gas-gangrene infection present on arrival of the patient at the hospital.

Of the 37 patients admitted from other hospitals and representing a selection of serious cases, 8 (21.6 per cent) died, all of streptococcal infection or septicemia. Of the 397 cases admitted directly from the field, 31 (7.8 per cent) died within a month; in 10 cases death was due to acute streptococcal infection, in 9 to shock or acute septicemia, in 5 to gas-gangrene infection present on arrival of the patient at the hospital, in 5 to multiple wounds, in 1 to meningitis (complicated by head wound), and in 1 to bronchopneumonia (due to gassing). These results show the value of the methods used in the treatment of war fractures.

Alice M. Meyers.

Van Gorder, G. W.: Surgical Approach in Supracondylar "T" Fractures of the Humerus Requiring Open Reduction. *J. Bone & Joint Surg.*, 1940, 22: 278.

A method is described for the treatment of supracondylar "T" fractures of the humerus by open operation. The author stresses the fact, at the outset, that open operation is not commonly necessary for this group of fractures.

A posterior approach through the triceps brachii muscle affords adequate exposure of the lower end of the humerus, including the articular surfaces and joint line, as well as allows access to the bone through a region devoid of large blood vessels and nerves, once the ulnar nerve has been retracted. The approach also allows great freedom in the use and selection of metallic fixation.

The author emphasizes the need for careful planning of the type of fixation to be used, including bending of the plates to their proper shapes over a skeleton upon which the outlines of the fragments, when replaced, have been visualized.

In the operative procedure, a pneumatic tourniquet is used. A longitudinal posterior incision is made in the midline from 5 in. above to 1 in. below

the tip of the olecranon process. After widely dissecting the skin and subcutaneous tissues, the ulnar nerve is isolated and gently retracted. The superficial fascia covering the triceps muscle is then cut in the shape of a long tongue the apex of which is about 4 in. above the olecranon tip, and the base of which spans the humeral condyles at the joint line. Care is taken to preserve a narrow margin of fascia along the muscular edges to facilitate the closure. The apex of the tongue contains only fascia but the depth increases to the base where all layers are included. After this tongue is reflected, another longitudinal incision is made down to bone, and the bone and fragments are exposed subperiosteally. In the closure, the deep layers of the triceps muscle and the periosteum are approximated first to the midline, after which the fascial tongue is sutured back into place. This exposure is more satisfactory than the usual "split triceps" incision because the latter requires very extensive stripping and marked retraction to give complete exposure. Illustrations of the operations as well as roentgenograms and photographs of patients before and after operation are included.

There were 3 unsatisfactory results in 8 operations. In 1 of the unsatisfactory cases infection occurred; in 1 a tourniquet was not used and hemorrhage which occurred required curtailment of the operative procedure. In the third case the humerus had previously been unsuccessfully operated upon from a mesial approach. In the second operation performed by the author, motion was established from 80° of flexion to 135° of extension with normal rotation.

ROBERT PORTIS, M.D.

Knoll, H.: Follow-Up Examinations of Elbow Fractures Treated by Immobilization (Nachuntersuchungen von stationaer behandelten Ellenbogengelenkfrakturen). Cologne: Dissertation, 1939.

More than 137 elbow fractures are reported, 55 of which could be followed up. They are classified as follows: (1) T and Y comminuted fractures 12 (6 followed); (2) fracture of the lateral condyle 8 (3 followed); (3) fracture of the medial condyle 9 (4 followed); (4) diacondylar fractures 8 (3 followed); (5) fracture of the capitellum 6 (3 followed); (6) fracture of the trochlea 7 (4 followed); (7) fracture of the radial head 22 (8 followed); (8) fracture of the radial neck 18 (9 followed); (9) fracture of the elbow 42 (11 followed); and (10) fracture of the olecranon 5 (4 followed).

In 9 cases a cubitus valgus was discovered as an after-effect of the injury; in 6 of these the patient had been treated conservatively, and in 3 the radial head had been excised. In 15 cases a slight muscle atrophy was present; 7 (all treated operatively) showed slight sensory disturbances. The functional results of the 32 cases treated conservatively were classified as very good and good (flexion extension from 40 to 170° to 60 to 160°, rotation not more than one-third restricted) in 87.5 per cent of the cases; as passable (90 to 140°, one-half restricted) in 3.1 per cent; and as poor (less than 90 to 140°, more than one-half restricted) in 9.4 per cent. For the 22 operative treatments that were followed up the results were very good and good in 63.6 per cent, passable in 18.2 per cent, and poor in 18.2 per cent. In severe intra-articular fractures which are conservatively handled good results are also usually reported, if special complications which cannot be laid to the procedure do not occur.

(WELCKER). RICHARD WARREN, M.D.

Hyman, G., and Martin, F. R. R.: Dislocation of the Inferior Radio-Ulnar Joint as a Complication of Fracture of the Radius. *Brit. J. Surg.*, 1940, 27: 481.

A series of 25 cases of dislocation of the inferior radio-ulnar joint is described and classified as follows:

Group I. Anterior dislocation of the head of the ulna as a component of severe Colles' fracture

Group II. Posterior dislocation of the head of the ulna associated with
(a) fracture of the shaft of the radius
(b) fracture of the lower end of the radius

Group III. Anterior dislocation of the head of the ulna with fracture of the shaft of the radius.

In describing the mechanism of the injury, the authors point out that the strength of the radiocarpal articulation causes the hand and wrist to be carried with the distal fragment of the radius, while the lower end of the ulna becomes passively dislocated in a direction opposite to that of the force of the original violence. There is disruption of the triangular fibrocartilage of the inferior radio-ulnar articulation with more or less disturbance of rotation of the forearm, the prognosis being poorer in Group I than in Groups II and III.

Treatment consists of manipulative reduction, and the suggestion is made that inclusion of the elbow in the cast will afford better ultimate function.

DANIEL H. LEVINTHAL, M.D.

Hetzar, W: Traumatic Lesions of the Intervertebral Disc (Die traumatischen Schaedigungen der bandscheibennahen Wirbelkoerperabschnitte). *Deutsche Ztschr. f. Chir.*, 1939, 252: 396.

Characteristic fractures of the vertebral bodies have not been classified as have fractures of the bones of the extremities. They are simply called compression-fractures, and scant attention has been accorded heretofore to the mild compression-fractures. In this fashion many functional injuries and complaints were explained. The vertebral bodies are composed not only of spongy shaft portions, but also of contiguous intervertebral supporting areas. The latter together with the intervertebral discs form, so to speak, a joint mechanism. Of importance are the marginal borders with their rims. Injuries to these may often produce more extensive complaints than a

compression-fracture. These may vary from a circumscribed marginal fissure to an avulsion of the fragments. "The fact that the outermost rim rises considerably above the plane of the vertebra endangers just that area which appears to produce extensive symptoms." In this respect buckling occurs less frequently in the upright position than in tilting or flexor movements. Many schematic drawings clarify the specific mechanisms. Marginal fractures are seldom seen in the more movable portions of the spine, the cervical and thoracic vertebræ; they are found mainly affecting the twelfth thoracic and the first two lumbar vertebræ, which are also the sites of predilection for compression-fractures. The functional rôle of the muscles must not go unheeded in the foregoing lesions. This is well recognized in fractures resulting from the strain of lifting, in which the fifth lumbar vertebra is chiefly involved. Frequently, the force producing a marginal fracture is quite mild.

In all, the author considers 46 cases, which, in part, he illustrates with case histories; some were recent, others old cases. The roentgen-ray diagnosis is not always easy; also, the differentiation between recent and old cases is not always definite, for both lesions may produce zones of rarefaction. Still more difficult to recognize are lesions of the intervertebral disc, particularly in marginal-fissure fractures. The nucleus pulposus is very elastic; usually the peripheral annulus fibrosus is damaged. Previously it was erroneously held that the preservation of the intervertebral disc established the differential diagnosis between vertebral fracture and inflammatory changes. However, in 30 per cent of the slightest marginal lesions the author demonstrated moderate narrowing of the disc. The latter was always evident in severe trauma; in many cases there was scarcely any intervertebral space remaining. As a rule, the superior disc is involved, since the superior vertebral table is usually damaged. One seldom sees cartilaginous nodes, since this depends upon the degree of nucleus pulposus damage. Immediately after an injury, roentgenograms show only an intimation, whereas four months later the cartilaginous nucleus may be significantly enlarged.

In conclusion, the author discusses the differences between the purely traumatic damages and the pathological marginal defects, which formerly were erroneously called marginal avulsions. The latter result from the undermining of the adjacent zone of bony rim by the cartilaginous nucleus (minor injury); they usually result from markedly forcible extension (extreme deflexion); they may be found in vertebræ of all densities, but chiefly in the fifth lumbar vertebra, which has a broad zone of suspension and in which displacement of the bony fragments is quite considerable. Except for the bone defect, the vertebral body shows a normal shape. In the healing process, the separation persists, since no bridging by callus formation occurs. The intervertebral disc participates indirectly as a result of the disc prolapse. In contrast, the purely traumatic marginal lesions of moderate degree show the following change: they generally occur from a compressing stress (extreme flexion mechanism); they usually involve the first lumbar vertebra. The roentgenograms, as a rule, show merely a suggestion of a fracture line (delicate zones of refraction or condensation). Frequently, displacement is absent or slight. In mild cases there is mainly a moderate compression of the anterior border; in more severe, complete avulsion there is significant compression of the entire vertebral body. Later one finds healing of the bony defects by callus formation. The intervertebral discs are narrowed.

(Franz). Jerome G. Finder, M.D.

Boehm and Oswald: Results of Treatment of Vertebral Fractures at the Hospital of the Aix-la-Chapelle Society of Miners in Bardenberg (Ergebnisse der Wirbelbruchbehandlung im Krankenhause der Aachener Knappschaft in Bardenberg). Cologne: Dissertation, 1939.

Formerly spine fractures were considered severe injuries. Patients were dismissed with a supporting jacket because Kuemmel's disease was feared, and they were recipients of more or less prolonged compensation. Malti, for example, even recommended a disability compensation of from 20 to 50 per cent.

The methods of Magnus and of Boehler brought about a complete change. In the severe cases, it was revealed that the spine fractures healed well without protracted prejudice to capacity for work, and compensation was no longer necessary. Detailed quotations were made from the experiences of Magnus and Boehler. The contrasting results favored the Boehler method: of 30 insured patients 18 (60 per cent) were taken off compensation after one-half year; 22 (75 per cent) after one year; 28 (95 per cent) after two years. Disability compensation was rated at 50 per cent in only 1 case; otherwise it was always under 35 per cent and an average of 25 per cent after twenty-five weeks. The Magnus method, on the other hand, showed that of 258 patients none were compensation-free after one-half year; only 33 (13 per cent) after one year; and 78 (30 per cent) after two years. For these reasons the Aix-la-Chapelle Hospital has followed the Boehler technique since 1931. Included, however, were all patients from 1925 to 1936, a total of 117. Seven had involvement of the cervical spine and of the remaining 110, 12 had involvement of the spinal cord. Of the latter, 4 died and the others drew a compensation of from 80 to 100 per cent. In total paraplegia resulting from transverse myelitis, the patients generally agreed to bilateral subtrochanteric amputations; thus they could ride well in an automobile and learned to get about on their stumps with the aid of their hands. The other 98 patients had compression-fractures with little or no participation of the spinal cord. The twelfth thoracic and the first three lumbar vertebræ were most often involved. When the lumbar vertebræ were involved, transverse fractures were demonstrable only exceptionally. Fifty-nine patients were treated according to Boehler in supine suspension

after local anesthesia. First the symptoms of shock were permitted to clear up and reduction was effected between the third and twenty-sixth day. After reduction an unpadded cast was applied, and the injured, since they were almost immediately relieved of pain, could then be up and about on the same day. After four or five days they were discharged as ambulatory and given instructions for systematic exercises. The cast was removed after an average period of three months. A late collapse, in the sense of Kuemmel's disease, was never observed, which was true also when Magnus' method was used. After removal of the cast the patients were again admitted to the hospital for some time in order to receive massage and exercises.

The mobility of the spine, as a rule, was entirely undiminished. Eight to fourteen days after removal of the cast, patients were permitted to resume work with initial caution.

The author then compares the results in 58 cases seen during the years from 1925 to 1930, prior to the adoption of the Boehler method, with those of the 47 cases seen during the years from 1931 to 1935. Previously, the method of Schmitz was employed after cessation of the shock symptoms: after about eight to fourteen days the patient was placed in the Engelmann traction apparatus with the head drawn up as high as possible in a well padded head-halter while the toes touched upon the floor, and then a plaster cast was applied. The difference is strikingly obvious: previously, after three years only 31.8 per cent of the patients were reduced to from 0 to 20 per cent disability compensation, while at present the same rating applies to 80 per cent of the injured after only two years. Of the latter group alone, 48.5 per cent no longer draw any compensation whatsoever. However, in general, these former results were no worse than those of other authors: according to Magnus, after three years 37.7 per cent drew no compensation, while Haumann reported 40.2 per cent, and Berger 45 per cent. Their first period averaged 36.4 per cent and the second period 48.5 per cent. Their period of treatment likewise compares approximately with those of other surgeons. The initial compensation reached 50 per cent in the first series and only 30 per cent in the second. A brace was never prescribed later. They noted the advantage of their treatment in that the patients could be permitted to be ambulatory early and therefore received a higher disability compensation for months before they resumed their occupations. In conclusion, numerous tables indicating the end-results in individual cases were included.

(Franz). Jerome G. Finder, M.D.

Compere, E. L., and Lee, J.: The Restoration of Physiological and Anatomical Function in Old Ununited Intracapsular Fractures of the Neck of the Femur. *J. Bone & Joint Surg.*, 1940, 22: 261.

The authors describe a method for combining internal fixation with bone grafts in the surgical treatment of ununited intracapsular fractures of the neck of the femur. The authors review other, previously described, methods of dealing with such cases and present illustrations of the salient features of many of them.

In the University of Chicago Clinics during the years from 1934 to 1936, union was obtained in 3 successive old ununited fractures of the neck of the femur by the use of, not one, but two tibial bone grafts. The only difficulties involved were those inherent in all cases requiring prolonged bed rest in a plaster-of-Paris spica, especially in persons of advanced age: stiff and painful knee or ankle, and the difficulty of obtaining free beds for the period of time which has been found necessary. It was therefore decided to use internal fixation of the fragments with three or more threaded wires to replace the plaster-of-Paris spica and allow early motion.

Reduction was carried out with the patient on a fracture table and the bone mechanically distracted after anterior arthrotomy of the hip. The uniting fibrous tissue and other structures about the joint were disturbed as little as was compatible with accurate anatomical replacement of the fragments. Well fitting tibial bone pegs were then driven into previously prepared channels ½ in. in diameter, drilled from the lateral side of the femur through the femoral neck into the head. Three or more stainless steel wires were then inserted to hold the fragments. These were .080 gauge with 56 threads to the inch. They were allowed to project 1 cm. from the lateral cortex to facilitate later removal.

Between May, 1937, and August, 1939, 5 cases were successfully operated upon by this method after periods of from five to eighteen months from the original fracture and solid bony union was obtained. A sixth, operated upon twenty-six months after the original fracture, gave an unsuccessful result because of infection occurring at the time of a second operation for readjustment of a wire that had penetrated too great a distance.

The first patient sat up in a wheel chair five days after operation and walked with crutches after twenty days. Roentgenograms made two and seven months postoperatively showed areas of absorption and compression of the femoral head, but at the end of three years the motion at the hip was found to be 80 per cent normal. The function in the affected hip in the 4 other successfully treated cases was also deemed excellent up to the time of the report.

Because of the tendency to partial collapse of the weight-bearing cortex of the femoral head in these cases, the author suggests that weight-bearing should not be permitted on the affected joint before five months after operation even if the union across the fracture line should appear to be solid before this. If the roentgenogram reveals evidence of aseptic necrosis in the femoral head, weight-bearing should be deferred for at least a year or until there is roentgenographic evidence of replacement or revascularization of the necrotic bone. The hip should, however, always be mobilized early.

Robert Portis, M.D.

Urrutia U. C.: The Surgical Treatment of Congenital Dislocation of the Patella (Tratamiento quirúrgico de la luxación congénita de la rótula). *Rev. de ortop. y traumatol.*, 1940, 9: 203.

Urrutia has reviewed 30 cases of congenital dislocation of the patella treated surgically by Putti at the Rizzoli Institute of Bologna. The protean aspects of the disorder in these cases have imposed such numerous variations in technique to meet the individual requirements that it may be said that practically all the different methods of treatment described up to now have been used. The lesions found included genu valgum, deformation of the femoral condyles, absence or alteration of the femoral condyle, deformation of the tibial epiphysis, internal rotation of the femur, external rotation of the tibia, smallness and ectopy of the patella, reduced contraction capacity of the quadriceps, and relaxation of the articular capsule and ligaments. The correction of these defects necessitated various interventions which may be classified according to the tissues on which they are performed, although several of these interventions were usually associated in one operation.

A variety of incisions has been recommended: the incision should be large enough to allow a good general view of the field and to permit change of the plan of operation, if necessary. The interventions on the bones consisted of correction of the genu valgum in order to change the axis of traction of the quadriceps (partial supracondylar section of the femur seemed to present sufficient advantages); limitation of the plane of displacement of the patella by creating an obstacle at the level of the external condyle (traumatic osteoperiostitis, insertion of a bone peg); deepening of the insufficient or changed trochlear groove to facilitate retention of the patella (the disadvantages are the necessity of long immobilization and, in children, damage to the growth cartilage); and elimination of the joint and resection of the patella, justifiable only in extremely grave lesions.

The interventions on the capsule and ligaments, which were relaxed especially on the medial aspect in habitual dislocation and retracted in permanent dislocation, consisted of tightening and reinforcing the capsule on the medial side, and of making a longitudinal incision on the lateral side: this opening may be covered by tissue taken from the medial aspect or from any other site. These interventions were complementary to others and could not be expected to prevent reproduction of the deformity by themselves alone: they should be devised carefully to avoid tearing out of the sutures when mobilization is started, and should be performed extra-articularly. The capsule may be reinforced by means of free grafts of fascia, and ligaments may be constructed from sections of the patellar tendon, the fascia lata, or the tendon of the flexor muscles of the thigh, of the sartorius, or of other muscles: these muscles are used to act on the patella. Medial transplantation of the tibial tuberosity with the patellar tendon attached to it is highly recommended.

The interventions on muscles were intended to utilize muscular action to maintain and pull the patella toward the medial condyle of the femur, to employ the tendons for the construction of strong ligaments, to keep the patella in place, and to facilitate the internal displacement of the entire extensor apparatus of the patella. For the muscular action, the vastus internus, sartorius, semitendinosus, semimembranosus, and internal rectus were employed: they were sutured to the internal border of the patella. The external vastus, which plays an important part in the dislocation of the patella, may be isolated from the quadriceps, partially resected, and fixed higher up to reduce its action.

The mixed interventions were the most effective and complete ones because they utilized the various components of the joint. At present, the interventions on the bones are generally limited to osteotomy, and all the procedures consist fundamentally in inward displacement of the extensor apparatus of the patella. Good results seem to be obtained with all the various techniques, as shown by the literature and the 30 reviewed cases. RICHARD KEMEL, M.D.

Wuethrich, A.: The Treatment of Fractures of the Head of the Tibia (Ueber die Behandlung der Tibiakopffrakturen). *Arch. f. orthop. Chir.*, 1939, 40: 71.

The author reports on 70 typical fractures of the tibial head occurring during the past eleven years, of which 25 were seen for follow-up examination and 22 were followed by letter. The greatest incidence involved the years from thirty to sixty and males predominated in the proportion of 41 to 29. In the earlier years of life the breaks were mostly marginal infractions, compression-fractures, and, in more extensive breaks, minimal displacements. Fifty-one and four-tenths per cent represented accidents of transportation. Direct stresses included 71.4 per cent of the cases, and infraction by indirect force 28.6 per cent. In motor-car accidents the distinction between direct and indirect stresses was not always easily made. The instances of indirect force were mostly those of falling or leaping on a more or less extended leg. The manifestations were those of swelling with effusion into the joint, pain on pressure, and interference with motion; occasionally there was abnormal mobility. Nearly all the breaks could be grouped into fissured or impressed fractures; the first group was the largest, with 50 cases. In this group one or both condyles were broken off, the lateral condyle oftener than the medial. There were also cases in which the fissured break was combined with an impression fracture. The head of the tibia was involved 7 times, however, always with breaks of the lateral condyle or both condyles, never when the medial condyle was the sole fragment split off.

Treatment in the vast majority of cases consisted in mobilization treatments after the effusion had disappeared, following treatment of the break by splinting, and compressive bandaging of the limb. Up to

the tenth day, 51 per cent of the patients had begun with the mobilizing exercises: a few by the third day, and the majority by the seventh to the tenth day. The exercises were at first conducted on a fracture frame, later on the edge of the bed. Exercises were conducted even while the traction was still being applied. Results were quite satisfactory with these frequently rather old patients, and clinical treatment could in most cases be omitted at the end of the fifth to the seventh week, the patient being confined to bed during four or six weeks of these periods. In 5 instances the fracture was immobilized in a plaster cast; most of these were severe breaks. However, the period of treatment was not essentially longer following three or four weeks' treatment in a plaster cast than that required for treatment by mobilizing exercises.

Operative reposition of the fragments was attempted in 2 cases, while in 2 others operation was necessitated by definite indications. In these cases the fragments were retained in the desired position by placing wires around them and drilling holes into them. Injury to the semilunar cartilage, and a severe central compression-break which could not otherwise be replaced and which interfered with the proper reconstitution of the joint were considered to be conditions which indicated operative interference.

The goal to be sought in any treatment is good mobility of the knee and a firm supportive function on the part of the leg. Uncorrected dislocation of the fragments will cause arthritic changes. Follow-up examinations have shown that the form of the fractured joint, once definitively established, can no longer be essentially influenced by the mobilization treatments. In only 4 of 24 patients were there no indications of flail motion in the healed joint. The mobilizing, or functional, method of treatment is adapted only to the milder fractures.

The details of 4 fractures without displacement, and 16 with displacement were appended separately as two tables. It is to be emphasized that despite displacement 10 patients finally acquired firm walking gaits, 9 of them with more or less good results as regards their functional capacities. However, in contrast to the assertion from other sources it must be emphasized that subsequent functional usage of the joint has no influence on its form. In those instances in which poor results were procured with the functional method of treatment, they are to be ascribed predominantly to compression-fracture, the more severe forms of which should be subjected to operative treatment, while the more severe types of fissured fracture will do very well also under wire-traction, and under reposition with a plaster-cast.

(Joh. Volkmann). John W. Brennan, M.D.

BLOOD TRANSFUSION

A Collective Review of the Literature from 1934 to 1939

THOMAS C. DOUGLASS, M.D., Chicago, Illinois

THE past five years have seen marked progress in the study of blood transfusion. The popularization of the simple nitrate method and the reduction in the frequency of reactions have stimulated the use of transfusions throughout the world. Probably the greatest contribution has been the development of the use of stored blood by the Russian workers, and its subsequent successful use in the Spanish Civil War. Acceptance of the rapid flocculation tests for syphilis has made transfusion safer.

Although the problem of the hemolytic transfusion reaction has been clarified by a host of investigators, its pathogenesis, treatment, and occurrence in transfusions which appear *in vitro* to be compatible are problems yet to be solved. Other aspects now being investigated include the effectiveness of transfusion, particularly immunotransfusion, in certain infections; the value of blood serum and lyophile serum in shock, burns, edema, and protein deficiency; and the properties and limitations of preserved blood.

The Effects of Blood Transfusion

The value of blood transfusion depends upon the increase in the volume of the circulating blood (Boycott and Oakley, Sibley and Lundy); the addition of living red blood cells (Dekkers, Schiodt, and Woronow), which act as oxygen carriers (Gohrbandt, Niederle, and Haden [143]); the addition of platelets and plasma proteins (Aldrich, et al.); and the addition of prothrombin and presumably hemostatic and immune bodies.

A healthy adult donor suffers no harmful effect from the withdrawal of from 500 to 750 c.cm. of blood (Lundy [220] and Chvilivickij). The study of donors has revealed some interesting facts. Martin and Myers found a reduction of 310,000 red blood cells from four to six hours after 500 c.cm. of blood had been withdrawn, an average hemoglobin loss of 5.2 per cent, and a weight loss of 1½ lb. The red blood cells are usually regained in from four to six days in man. Merklen, Israel, and Apffel examined 20 donors who had given from 2 to 15 liters of blood over a period of from one to fourteen years, and in only 1 was the red blood count below four million. Cadham (54) withdrew from 65 to 140 c.cm. of blood at one-week intervals from six to twelve times without ill effect. Six months later all the donors were well and showed no blood changes. Transmission of disease to donors has been reported (Tzanck and Martineau [358]—septicemia; Klauder and Butterworth—syphilis; Wright—malaria). This danger, however, has been reduced by use of the newer direct transfusion apparatus and is absent in citrate transfusions.

From the Department of Surgery Northwestern University Medical School and Passavant Memorial Hospital.

Indications

The indications for transfusion have not been greatly extended in recent years; however, physicians are generally more alert to the indications (Cooksey [65]).

Acute Hemorrhage

Hemorrhage has been the prime indication for transfusion since the time of Lower.

In obstetrical and gynecological cases Stetson advocates transfusions of from 600 to 800 c.cm. as a minimum. Dieckmann and Daily believe that a substantial reduction of the obstetrical mortality from hemorrhage can be obtained if sufficient blood is administered to raise the hemoglobin to about 10 gm. Transfusion has also been advocated in functional uterine bleeding (Goudim-Levkovitsch; Alovski and Burceva), for which Ehrhardt and Winkler recommend the use of blood of pregnant women.

The question of transfusion for serious gastrointestinal hemorrhage is unsettled. Some men (Creed, Turner and von Briesen) regard this condition as a contraindication, while others (Wood, Bock [36], Cooksey [65]) believe that there is no basis for the belief that a transfusion may start further bleeding, and they maintain that transfusions are hemostatic. Filatov, Majanc, Kartasevskij, and Doepp (111) found that 84 per cent of the patients recovered if a transfusion was given before shock developed, while only 40 per cent recovered if transfusion was delayed until after the appearance of shock. Transfusions have been more frequently used since Marriott and Kekwick (236, 237) demonstrated that large quantities of blood might be given very slowly and

without danger by a continuous drip method, and the recent literature contains many reports of cases successfully treated in this manner (Black [27], Cubitt, Herrell, Silverman, Starlinger, and Winterton). The Russian workers (Filatov and Kartasevskij [110], and Burceva [53]) believe that preserved serum may be as effective here as whole blood.

The situation is somewhat similar in the case of hemoptysis due to pulmonary tuberculosis (Turner and von Briesen, Pierre-Bourgeois, Gisselbresch, and Commerson-Teyssier, Kayarnovskaya and Mordvinkina).

Although anemias due to subacute or chronic hemorrhage respond promptly to medication, blood transfusion is sometimes desirable in the severe cases. It has been suggested that copper be added to transfusions given in these cases (Sai).

SHOCK

Shock is probably as urgent an indication for transfusion as is hemorrhage, and when the two are coupled, as they often are, the indication is even clearer. The beneficial effects of blood transfusion in shock was clearly demonstrated in the recent Spanish Civil War (Jorda [178] and Saxton). Bond and Wright have shown that lyophilized blood serum, i.e., evaporated blood serum, maintains the blood pressure for several hours in dogs in shock. Mahoney has further shown that lyophile serum is more efficacious in maintaining the blood pressure in the shocked animal than whole blood, saline, or gum acacia. He points out that the concentrated solutions of the dry serum because of their greater colloidal value have more power to hold fluid in the vascular tree. The use of simple preserved blood plasma has been advocated in the treatment of hemorrhage or shock (Lehman, Elliott [102], Heinatz and Sokolow, Tatum, Elliott, and Nesset). Tatum, Elliott, and Nesset have given blood plasma to 191 patients without typing and have had no reactions of any kind. Since it seems possible that preserved plasma may be given without typing, a patient in severe shock may receive this fluid without the delay necessary for typing and cross-matching whole blood.

Although transfusions have been used in the treatment of burns for many years (Jennings and Bauer), Mahoney and Lehman have only recently advocated lyophile serum in burn shock. Trusler, Egbert, and Williams have found experimentally and clinically that repeated transfusions of blood and serum offer the only safe means of maintaining the chemical balance in burn shock. It should be remembered that when a patient is receiving gum acacia for shock the gum solution should be rinsed from the apparatus before blood is added as clotting will result from a mixture of the two (A. V. Bock).

PRE-OPERATIVE AND POSTOPERATIVE USE

Blood transfusion is at present most frequently used as a pre-operative or postoperative measure. Seventy per cent of the transfusions at the Mayo Clinic (Lundy [224] et al.), and 60 per cent at Tulane (DeBakey [80]) are given for this purpose. Haden (144) reports that major surgical cases are almost routinely given transfusions after surgery at the Cleveland Clinic.

HEMORRHAGIC DISEASES

Thrombopenic purpura. Blood transfusion has been advocated in thrombopenic purpura by many (Debré, Lamy, and Sée, Blumberger [35], Lescher, Bradford, Creed). Since it supplies the need for red blood corpuscles and platelets, citrated blood is thought by many to be as effective in hemorrhagic diseases as is whole blood (Cooksey [65]). Preserved blood, more than two or three days old, is deficient in platelets (Kolmer, Fantus and Schirmer [108]), and for this reason fresh blood is preferable. Bock (36) recommends small (300 c.cm.), frequently repeated transfusions, while Fonio has suggested that the platelets be separated and only these administered.

Hemophilia. In hemophilia, transfusion is often the only method of stopping hemorrhage (Osgood and Ashworth). Emile-Weil and Scemana have reported a case with recovery after 25 transfusions (12 liters), and beneficial results have been reported by Svejcar, Lescher, and Creed. Bock (36) believes that each patient should be given 500 c.cm. of blood followed by repeated small transfusions every second day until the hemorrhage has been controlled. Frey stresses the value of transfusions in eye operations or in eye injuries in hemophiliacs.

Hemorrhagic disease of the newborn. Transfusions have long been known to be helpful in hemorrhagic disease of the newborn. Recent confirmation has been supplied by Franco, who has reported 4 cases of recovery, and recommends that from 30 to 50 c.cm. of unmodified blood be given. In the absence of compatible blood from 10 to 30 c.cm. of whole blood may be given intramuscularly every four to eight hours (Wiener).

Jaundice. Until the recent discovery of Vitamin K, blood transfusion was the only protection from hemorrhage in jaundice. Judd, Snell, and Hoerner reported that in their experience one or more transfusions before surgery and one after, best

protected the patient from bleeding. Citrated blood was as effective in their cases as whole blood. In 1935 Quick, Brown, and Bancroft described the prolonged prothrombin time in jaundice. Vitamin K with bile salts has been found to reduce this time, and with it the hemorrhagic tendency. In spite of this definite advance in the treatment of jaundice, blood transfusion remains a valuable method of increasing the efficiency of the parenchymatous organs and of reducing the incidence of hemorrhage (Walters). Recent work by Rhoads and Panzer with Quick's method has shown that the prothrombin time of preserved blood is prolonged, and that to be effective blood must be less than three days old. It has also been observed that the transfusion must be frequently repeated since its protective power does not last more than three or four days (Wiener).

ANEMIA

Familial hemolytic jaundice. Patients with familial hemolytic jaundice frequently need transfusion either to tide them over a hemoclastic crisis or to prepare them for splenectomy (Bock [36]). Frequent and severe reactions have been noted in this condition by Boller and Falta, Clément, and Sharpe and Davis, but Haden (144) states that at the Cleveland Clinic these cases have received repeated transfusions without reactions.

Acute hemolytic anemia of Lederer. Acute hemolytic anemia of Lederer is usually cured by a single transfusion (Lederer) or multiple transfusions (Baxter and Everhard).

Erythroblastosis fetalis. Patients with erythroblastosis treated by transfusion have recovered (Clément and Jennings).

Icterus gravis neonatorum. Icterus gravis neonatorum responds well to transfusions (Clément; Larderich, Mamou, and Beauchesne; Marie and Boutet). Wood believes that this treatment is specific.

Aplastic anemia. This disease occupies a position somewhat similar to that formerly held by pernicious anemia. Only transfusions can keep the patient alive until spontaneous recovery occurs, or the cause of the disease has been eradicated. Boon has reported recovery of a patient with aplastic anemia from arsphenamine poisoning who had 25 transfusions over a period of nine months. Patients with anemia due to benzol poisoning have also been tided over the crisis with blood transfusions (Bock [36]). Osgood and Ashworth recommend that these patients be given transfusions often enough to keep the white blood count and platelet count up to as near normal as possible.

Pernicious anemia. Although not often essential in the treatment of pernicious anemia since the discovery of liver therapy, transfusion still has a place in the severe case until the liver therapy can become effective. Osgood and Ashworth believe that with a red blood count below 1,000,000, transfusion is indicated.

DISTURBANCES OF LEUCOCYTES

Leucemia offers no positive indication for transfusion except in those patients with anemia. Because of the hopeless prognosis and rapid progression of acute leucemias and the general agreement that transfusion has no influence on the leucemic process, it is believed that these cases should not be transfused (Osgood and Ashworth, Boller and Falta, Wiener, and Haden [143]). Patients with the subacute and chronic types of leucemia may be made more comfortable and their lives prolonged by transfusion (Haden [144], DeBakey [80], Osgood and Ashworth). Hodgkin's disease is regarded similarly by some (Creed, DeBakey [80]). The suggestion of Gosio that lymphoid and myeloid leucemic bloods may be exchanged is not commonly followed. Osgood states that the leucemias are possibly transmissible in this fashion. Creed believes leucemia is a contraindication to transfusion because of the frequency of reactions. This also applies to aplastic anemias, in which Lewisohn (213) reported reactions in 20 per cent as compared to 1½ per cent in other cases.

Agranulocytosis. Blood transfusion has been frequently used in the treatment of agranulocytosis (Shea, Haden [144]; Debré, Lamy and Sée, Clément, Lainer), but it has been regarded as of little value by Lescher, and Osgood and Ashworth, and of only supportive value by Cooksey (65) and others. Blumberger (35) believes it has no value.

INFECTIONS

Immune transfusions. While admitting the indication in cases developing an anemia during the course of the infection, many writers doubt that blood transfusion has any specific value in treating infections (Wiener, Haden [143], Blumberger [35], Cooksey [65]). Jeanneney (170), Gill (127) and Lynch have called attention to the immune properties of normal human blood and the increased number of immune bodies contained in the blood of convalescent or artificially immunized donors. Gill (127) believes that leucocytes, complement, opsonin, agglutinin, leucins, and plakins may play some part in combating infections. Crocker, Valentine, and Brody inject the donor with typhoid vaccine intravenously several hours before the contemplated transfusion, and have

reported successful results, as have others (Gill [126] and Lynch). Jeanneney has also demonstrated that use of a combined vaccine (tetanus, diphtheria, staphylococcus, and typhoid) increases the bactericidal power of the donor's blood. According to these workers the donor who is capable of developing the greatest number of antibodies for the specific organism should be selected for such a transfusion. Lyons chooses the donor who possesses the greatest natural immunity as shown by the opsonizing effect of the donor's serum on the patient's cells.

Although some immune properties are preserved in stored blood, fresh blood is probably more effective in infections (Karavanov [182], Jorda and Aleu, Gnoinski, Kolmer).

Septicemia. There is some doubt as to the efficacy of transfusion in sepsis. Levin and Kartasevskij state that transfusion has an indifferent effect and that immune transfusion is as yet an open question requiring further clinical and laboratory research. Many others have a similar view (Blumberger [35], Haden [143], Bock [36], Erbsloeh, Cooksey [65], Svejcar).

Cadham (55), Knoflach, and Frsanowich have had favorable results from the use of transfusion, while similar and more enthusiastic reports on the use of immune transfusion have been made by others (Govaerts, Kottke, Dyson and Miller, Jeannin and Chomé, Boller and Falta, McClendon, Bacon, Stahl, Lyons, Kogan, Gill [127]). Immune transfusions appear to have particular value in otogenic sepsis (Piercy, Shea, Gill [126, 127], Lynch).

Transfusion in sepsis of puerperal origin is believed to give better results than in other types of sepsis, especially if immune donors are used (Van Damme-Gent, Kayne, Kutscha-Lissberg, Gosselin, Walker and King, Terechova, Keller and Limpach [188]). Small transfusions (50 to 150 c.cm.) every day or every other day have been used.

Despite occasional isolated reports (Stenström and Gripwall) of cures in cases of bacterial endocarditis following immune transfusion from donors immunized with an autogenous vaccine, most authorities agree that the condition is probably not benefited by transfusion (Sinek, Speidel, DeBakey [80]). Kilgore reported failure of immune (autogenous vaccine) transfusions to benefit cases of subacute bacterial endocarditis and stated that he did not believe that a single unequivocal cure is on record.

Cases of sepsis have recovered following the accidental administration of incompatible blood (Bourgault, Paliquin, and Kammerer), and Spiridonov has gone so far as to advocate this as a method of treatment. Such heroic treatment is not justified until we have an effective means, not now available, of combating hemolytic transfusion reactions.

Scarlet fever. Blood in small quantities has been noted to produce a Schick negative reaction, but not necessarily an immunity as indicated by the Kellog test (Thelander). Transfusion has not been found to increase the antifibrinolysin or antistreptolysin in recipients (Lippard and Johnson). That transfusions are of great value in the management of scarlet fever was clearly demonstrated by Zyukov, Shekhet, Zavoyko, and Meshcherskiy who reported that 61 of 93 cases were aborted by immune transfusions. They used chiefly convalescent donors. Many others have had similar experiences (Boller and Falta, Jennings, Vlados [364], Hamilton). Preserved blood older than two days is not effective (Zyukov, Shekhet, Zavoyko, and Meshcherskiy).

Erysipelas. Blanchard and Bell reported that from 6 to 8 c.cm. of blood per pound of body weight given every other day will carry a patient over a critical period of erysipelas. Bradford regards its use favorably, while Hamilton believes it of little value.

Measles. Zingher has found that measles may be prevented or aborted by the injection of from 5 to 40 c.cm. of serum, plasma, or whole blood from a convalescent donor. Boller and Falta, and Blumberger (35) have had good results in the treatment of measles, but Hamilton is of the opinion that it is of less value in this condition than it is in scarlet fever.

Diphtheria. Seckel reported that the mortality was lowered in malignant diphtheria from 80 to 40 per cent in a series of 42 cases. Blumberger (35) and Boller and Falta have also had favorable results.

Typhoid fever. A recent report of 41 cases by Lantin and Guerrero showed a reduction in mortality of 50 per cent by the use of transfusions. Several investigators have also reported marked and dramatic improvement in severe cases of typhoid fever treated by immunotransfusions (Jennings, Blumberger [35], Habel and Crocker). Sinek is not convinced of its value in this condition.

Anterior poliomyelitis. Rosenthal (295) believes convalescent blood is more effective than convalescent serum. Sherman has reported some reduction in mortality with immunotransfusions, but Gay found no difference in the incidence or extent of paralysis in a small series of cases treated by transfusion.

Undulant fever. Creswell and Wallace have reported apparent cure in 2 cases of undulant fever treated by immune transfusions. Poston and Menefee, Blumberger (34), and Cooksey (65) agree that the results are striking in this disease.

Pneumonia. In lobar pneumonia transfusions have been used infrequently probably because of the fear of increasing pulmonary edema or causing reactions. Arena reported a shorter duration of the illness and a lower mortality in 24 patients given 20 c.cm. of blood per kilo than in 35 controls. Acuna and Fernandez, MacNeal and Neil, and Shipton and Lawes have also had good results with this treatment.

Miscellaneous infections. Many other conditions in which transfusions have been used are: influenza (Tzanck [354]), meningitis (Walker and King, Schmidt), rheumatic fever (Vlados [364], Rosenberg), ulcerative colitis (Boller and Falta, Bradford, Sinek, Hulst and Hartog), peritonitis (Jeanneney and Ringenbach [172]), pemphigus vulgaris (Scherber, Loreti), pyelitis of pregnancy (Douglass and Laughlin), empyema (Schlegel and Bradford), serous tuberculosis (Krizhevski), lymphogranuloma inguinale (Brady), kala azar (Mathieson and Watson), herpes zoster of the cornea (Frey), Weil's disease (Lescher), psittacosis (Boller and Falta), epidemic encephalitis (Wiener), and bronchopneumonia (Murano, Tassovatz, Clément, Acuna and Fernandez, Viau).

INTOXICATIONS

Nephritis. According to DeBakey (80) and Bock (36), nephritis constitutes one of the chief contraindications to transfusion because of the possibility of hemolytic reactions, elevation of the blood pressure, or aggravation of the kidney lesion. Mosenthal states that transfusion aids in uremia by combating edema and by relieving the secondary anemia in nephritis. For these reasons he believes that transfusion is often indicated in nephritis. He has shown that anuria following transfusions occurred no more frequently in nephritics than in non-nephritics; moreover, some actually developed a diuresis. He also believes that early in the course of nephritis the giving of blood often results in a long remission of the secondary anemia. Cooksey (65) also believes that blood is of value in early nephritis and in cases with a nephrotic edema. The successful use of concentrated solutions of "lyophile" serum in the treatment of nephrosis has been reported (Aldrich, Stokes, Killingsworth, and McGuinness).

Methemoglobinemia from any type of poison has been treated successfully by means of transfusion or exsanguinotransfusions (Majanz, Niederle, Boller and Falta, Jennings). Many other types of poisoning have also been treated by transfusion; carbon monoxide (Wiener), mercuric chloride (Hashinger and Simon), arsphenamine poisoning (Boon), eclampsia (Meyboom), strychnine (Boller and Falta), and mushroom (Boller and Falta).

Some other indications for which transfusion has been suggested are marasmus (Thompson), malnutrition in infants (Clément, Debré et al.), arsphenamine dermatitis (Kuske), pyloric stenosis (Debré et al.), gastroduodenal ulcer (Ryss and Stroikova, Bagdassarov, et al. [13]), diabetic coma (Arborelius, Boller and Falta), blackwater fever (Blackie), rickets (Wolff), myasthenia gravis (Marinesco), dementia præcox (Reiter), and Winckel's disease, pellagra, and bronchial asthma (Wiener).

CONTRAINDICATIONS

ACUTE PULMONARY EDEMA

Acute pulmonary edema is the one absolute contraindication to blood transfusion on which most authorities agree (DeBakey [80], DeGowin [86], Collier, Cooksey [65]). Many other contraindications have been mentioned, but Wood and Haden (144) believe that no contraindication exists if anemia threatens the life of the patient. Although DeBakey (80) believes that nephritic conditions associated with anuria or oliguria are contraindications, Mosenthal and others disagree (Cooksey [65]; Aldrich, Stokes, Killingsworth and McGuinness). Bleeding ulcer, bleeding varices, and pulmonary hemorrhage are not absolute contraindications if care is used in administering the blood. Embolism and purulent thrombophlebitis have been mentioned as a contraindication (DeBakey [80]).

SELECTION OF THE DONOR

Male donors from eighteen to forty-five years of age are generally preferred because of their size (DeBakey [80]). A careful history should be taken to exclude allergy, syphilis, and malaria, as well as acute infectious diseases. A physical examination with particular attention directed to the genitalia for manifestations of syphilis is essential. A Kline test should also be performed on the blood of the donor immediately before the transfusion. A blood count should be done for the protection of the donor.

Typing. For many years it has been standard practice to group recipients and donors into the divisions A, B, AB, or O as first described by Landsteiner in 1900. Subgroups (A_1, A_2, A_1B and A_2B) have been described, but because of technical difficulties have received little attention

except in experimental laboratories. Davidsohn (77) has recently reported a method for identifying these subgroups which he believes is practical clinically. The subject requires further investigation before its importance can be determined.

Hetero-agglutinins. Landsteiner and Levine in 1927 discovered that individuals possess heterogenous agglutinogens capable of producing specific agglutinins in rabbits. Three types of these agglutinogens were found and designated M, N, and MN. They are said to follow the same hereditary distribution as the iso-agglutinins. Identification of these agglutinogens is not at present practical in the ordinary clinical laboratory (Taylor and Ikin). It has not been shown that this property has any bearing on transfusions (Blinov [33], Taylor and Ikin). The chief value of this work to date is in the extension of the medico-legal use of blood typing (Wiener).

The Moss hanging drop, the Vincent open slide, or the Landsteiner centrifuge method are the standard procedures used in typing. (Wiener, Larson, Brewer [49], Cameron [56]). It is important that the specimen be agitated during the procedure (Culbertson and Ratcliffe). It has been shown repeatedly that a low-titer typing serum may cause errors in grouping (Larson, Davidsohn [77]). The most common of these are the mistaking of A_2 or A_2B for Groups O or B, respectively, because of the frequent low agglutinogen titer of Group A_2. (Taylor and Ikin, Davidsohn [77]). High-titer typing serum may be obtained from donors of known high titer, by concentration of the serum (Hoxworth and Mahoney), from patients with serum disease (Davidsohn [76]), or from the serum of rabbits sensitized by the injection of sheep cells (Davidsohn [77]).

Cross-matching. After the patient has been typed, a donor of the same group or a universal donor is obtained and a direct compatibility test is usually performed. Despite reports designed to show that the use of this test is not necessary (Horton and Watkins, Brines) most authors believe that it aids in detecting errors in typing and any abnormal agglutinins which may be present (Neter, Martin [238], Simonin [322], Lescher, Scannell, Saye, Iancu and Opusiu, Larson, DeGowin [86], Wood, Jennings, Rosenthal [294]). Oliver has reported the incompatibility of a Group AB donor 22 times in 44 trials on the basis of the cross-match. Some investigators believe that all hemolytic reactions may be avoided by care in typing and cross-matching (Bordley, Margulies, Jones and Rathmell [176]). Compatible donors must be used for intraperitoneal transfusions (Clausen).

Donor services. In order to provide donors who have been typed and are readily available for transfusions, a number of organizations have been established. In Russia (Burceva [52]) a voluntary donors' organization has been set up, with a central agency which guarantees the safety of both donor and recipient. The wide use of post-mortem blood has reduced the need for this agency in civil practice. Volunteer donor services organized by the Red Cross are also in use in England and Scotland (Black [28], Dyke, Oliver). In most cases donors are not paid, but are available for calls from hospitals as a purely public service. Similar organizations are active on the European Continent (Tzanck and Andre [355], Seggel [312]). In this country the American Red Cross has organized donor units in many cities (Nelson, DeKlein, Corwin). The Blood Transfusion Betterment Association of New York has an excellent organization which supplies professional donors to hospitals (Stetten). Citron has reported a private agency in a country community in which are listed 10 donors who have been examined, typed and are ready for any emergency. During the Spanish War it was evident that only preserved blood could meet the need for a large number of transfusions on short notice (Jorda [178], Ravenna). To provide blood in sufficient quantities donor services were organized in Madrid and Barcelona among the civilians. Blood was taken from the donors in a central laboratory, filtered and sealed in ampoules to be transported to other parts of the city, or placed on ice and later taken to any section of the battle front. Plans for similar organizations have been perfected in other European countries (Maisonnet and Jeanneney, Morell). According to Levine and Katzin, about one-half of the hospitals in this country maintain their own list of donors.

Methods

A description of all the methods of transfusion would be of no value. It may be said without fear of contradiction that the great majority of methods now in use are satisfactory.

Direct transfusion in which the artery of the donor is attached to the vein of the recipient has been outmoded because of its inherent difficulties and dangers.

Indirect transfusions include all those now in use and may be divided into methods by which unmodified or modified blood is used.

Unmodified blood transfusions. These include all methods utilizing paraffin-coated containers, athrombit tubes, multiple syringes, syringe-valve mechanisms, or continuous-flow apparatus. They

are less used at the present time than previously, following the popularization of modified transfusion techniques. Automatic ball-valve apparatus for changing the direction of the flow are to be condemned, because an accumulation of small clots prevents tight closure, and permits blood from the recipient to reach the donor (Levine and Katzin). The chief advantages of all unmodified methods are that the blood is rapidly and easily transfused without the addition of a foreign substance and without the presumably untoward effects of temperature change. The disadvantages of these methods are that they require considerable skill, necessitate rapid administration, and have the psychological disadvantage of requiring proximity of the donor to the patient. It might also be mentioned that the open methods require an imposing array of apparatus which may unduly impress the patient with the seriousness of his condition.

Modified blood transfusions. Sodium phosphate, hirudin, sodium iodide, arsphenamine, sodium hyposulfate, and magnesium sulfate have been used as anticoagulants, but sodium citrate is by far the most frequently used. Blood defibrinated by stirring has been used for transfusions but has been found to be more toxic than citrated blood and to deteriorate more rapidly (Bagdassarov [12], Fischer). A recent addition to the anticoagulants used for transfusion is heparin.

Sodium-citrate transfusions may be given by the open method as originally described by Lewisohn, or by a closed method which is far more popular at present. Advantages of the citrate transfusion are its simplicity, the feasibility of giving blood at the desired speed, and the favorable psychological effect on both donor and recipient in minimizing the procedure. Disadvantages of the citrate method are the addition of a foreign substance to the blood (Minot, Dodd and Bryan), and possibly the greater frequency of reactions (Parker, Eddy, Shea, Knoll and Schuerch, DeBakey [80]). Some investigators, however, (Brewer [48], DeGowin [87]; Debré, Lamy, and Sée; Jeanneney [169], Lewisohn [213]), believe that sodium citrate produces no ill effects, and others (Clément, Meleney et al., Hustin and Dumont, Cooksey [65], Bates, Albright, Lewisohn and Rosenthal) find reactions no more frequent. Osgood believes that if a slight increase in the percentage of minor reactions does occur, the other advantages still far outweigh the disadvantages. Cooksey (65) in surveying the hospitals and their transfusion technique found 60 per cent using citrate transfusions. Levine and Katzin found the citrate method used as frequently alone or in combination as all other methods combined. Those favoring a closed method point to the absolute sterility easily obtained and the absence of serious trauma to the cells. The use of a filter in citrate transfusion is unnecessary if the blood is given immediately (Wenzel and Hammer, Brewer [48], Cooksey [64]). The blood should be filtered if it is stored or fibrin clots have formed.

Heparin. Sköld found that if added to blood in amounts of from 0.1 to 0.2 gm. per 100 c. cm. of blood, heparin would prevent clotting for from 105 to 120 minutes, and reported 17 transfusions by this method. In the same year Hedenius (152) found that 150 mgm. of heparin injected into a donor prolonged the clotting time to from 15 to 29½ minutes and the effect lasted for one hour. There was no effect on the coagulation time of the recipient. This work has been confirmed by Knoll and Schuerch, and Schuerch. In 1937 Hedenius (153) reported the use of heparin in 150 transfusions performed by a semi-direct method. Others have also used heparin successfully (Clemens, Heim, Tretow, Grimberg and Krauss [139]). This substance may prove to be less harmful than sodium citrate as an anticoagulant, but its use has been too limited to permit evaluation at this time.

The temperature of blood. It has been the custom to warm modified blood before or during its administration, and various devices have been used for this purpose. Tuohy (351) and Vlados and Meerson (363) believe that the temperature is important in preventing or minimizing reactions, but their evidence is not convincing. Arev and Erikson (106) report that it is almost impossible to transfuse with blood warmer than room temperature even though it be heated to 140° F. in the container. Tests of various warming devices yielded similar results. No disturbances were noted in dogs when cold transfusions were given (Arev). Because of the hemolysis occurring when preserved blood is overheated, some hospitals have discontinued this practice (Erikson [106], Gwynn and Alsever). Modified blood transfusions have thus probably always been given at room temperature. Since it is known that heat not rigidly controlled may be dangerous, it seems advisable to give transfusions at room temperature.

Routes of administration. In a great majority of cases no difficulty is experienced in the injection of blood into the veins of the recipient. When difficulty is experienced, unusual sites have been suggested: intraperitoneal (Koenen and Vonk), intramuscular (Lundy, Tuohy and Adams [222]), the abdominal aorta (Tuohy [352]), direct injection into the heart, or the longitudinal sinus. These methods are not without danger (Levine and Kat-

zin, Clément; Debré, Lamy, and Sée). The surgical exposure of a vein seems a more logical and a safer procedure. Descriptions of technique in exposing a vein are given by many authors (Spivek, DeBakey [79], Prioleau).

Rate of administration. Unmodified blood transfusion requires speed to prevent clotting, and the average speed in such a transfusion is said to be from 50 to 100 c.cm. per minute (Wiener). A slower rate has been thought more desirable by many authors (Wiener, Bates, Clemént, MacNab, Kriajimski, Vlados and Meerson [363], Tuohy [351], Tzanck and Dreyfuss [357]). DeBakey (78), and Rathmell and Crocker do not agree that the rate of administration is important. One hundred cubic centimeters per six to fifteen minutes is considered safe for citrate transfusions.

Autotransfusion. In cases of ruptured solid organs blood found in the body cavities or viscera is often reinfused. Specifically, the use of such transfusions has been reported in ruptured ectopic pregnancy (Tiber, Stabler, Knaus, Hajek), intercranial operations (Davis and Cushing), hysterotomy (Wallingford [367]), wounds of the spleen or liver (Renton, Tinker and Tinker, Springer, Andreev), stab wounds of the abdomen (Smith [327]), stab wounds of the heart (Watson and Watson [369]), and hemothorax (Watson and Watson [370]).

Contraindications to the use of autotransfusion are hemolysis—usually from sixteen to twenty-four hours after bleeding—(Watson and Watson [370]), infection or malignancy (Wallingford [366]), and ruptured hollow viscus (Watson and Watson [370]). In reviewing 273 cases Watson and Watson (370) found 4 deaths believed to be due to hemolysis. DeBakey (82) and Wiener believe autotransfusion should not be used unless a compatible donor is not available. However, the availability of the blood and its relative harmlessness make its use desirable (Wallingford [366], Tiber).

Preserved blood. Although much research had previously been carried out on blood preservation, its extensive clinical use is due to the excellent work of Shamov and Yudin. Yudin (384) in 1936 reported 1,000 transfusions with preserved cadaver blood, based upon the experimental work of Shamov.

The Mayo Clinic first began using preserved blood from living donors in 1935 (Lundy et al. [221]). The stimulus of the Spanish War in which large quantities of preserved blood from living donors were given without difficulty, together with the favorable reports by Lundy (222, 223), led to the establishment of blood banks. Fantus (107) and his group at the Cook County Hospital devised a scheme for preserving blood from living donors which is so successful that a great many institutions now have some sort of blood preservation laboratory (Hall, Erikson [105], Giddings and Kruger, Patton, Cameron and Ferguson [57], Biddle and Langley).

Blood for storage has been obtained from cadavers (Yudin [384]), placentas (Goodall [132]), or living donors. In this country the latter are by far the most frequent source. Rigid asepsis and the avoidance of agitation of the blood because of danger of increasing hemolysis must be observed in drawing blood for storage (Grimberg [138], Wiener).

Among the anticoagulants used are the solution IHT developed at the Moscow Institute (sodium citrate 5.2, sodium chloride 7.0, potassium chloride 0.20, magnesium sulfate 0.04, and water 1000 c.cm.), sodium-citrate solution, sodium-citrate and glucose solution, Italian transfusol (Battaglia and Tropeano), and arsenobenzol (Fischer).

Blood is stored at from 0 to 4° C. There must be no agitation of the blood. During storage a Wassermann test and blood typing may be done. All stored blood must be filtered before its administration as cellular débris and clots may form (Fantus [108], Gnoinski, Cameron and Ferguson [57], Tatum, Elliott, and Nesset). Jorda (178) filtered the blood before storage and obtained excellent results. Opinion is divided as to whether or not stored blood should be heated. Many (Tuohy [351], Jorda [178], Mitchiner and Cowell, Fourestier and Paillas) believe that cold blood may produce more reactions and for this reason they warm it slightly before injection. In order to avoid overheating, many laboratories allow the blood to stand at room temperature for thirty minutes before its administration (Erikson [106]). Attempts to sterilize blood by means of antiseptics proved ineffective when small doses were used, and destroyed the blood cells when larger ones were used (Fourestier and Paillas).

Bagdassarov (12) and Costa have stated that blood may be used after a longer period of storage if preserved in glucose solution. This finding has been confirmed recently by DeGowin et al. (88), and Gwynn and Alsever. Most workers, however, have agreed that blood should be discarded if not used within ten or fifteen days (Grimberg [138], Elliott, McFarlane and Vaughn [101], Filatov [112], Cameron and Ferguson [57], Fantus and Schirmer [108], Giddings and Kruger). Others believe that storage for a shorter time is advisable (Karavanov [183], Belenkiy, Hall, Belk, Henry

and Rosenstein [25]). Although blood may be used after storing for a longer period, Lundy (224) avoids the use of blood more than a few days old by drawing little more than the anticipated requirement.

Certain changes occur in preserved blood regardless of the type of anticoagulant or the care in other factors of storage. Red blood cells persist longer than any other living constituent under storage conditions. These cells begin to show changes in form, such as crenation, by the third to sixth day (Jeanneney [169], Kolmer), and their number decreases about the tenth day, when hemolysis begins in most specimens. The longest period of preservation without hemolysis is possible in glucose-citrate solution (Grimberg [138], DeGowin et al. [88], Belenkiy, Filatov [114], Doepp, Gwynn and Alsever) or IHT-glucose solution (Barton and Hearne). Adjustment of the pH may also retard hemolysis (Cotter and MacNeal). All authors agree that hemolysis of stored blood is a positive contraindication to its use.

White blood cells show degenerative changes much earlier than red blood cells. Of these, the polymorphonuclear leucocytes are more rapidly destroyed than lymphocytes (Gnoinski, Jeanneney [169]). Vlados (362) showed that the number of white blood cells is reduced to less than 1/10 in from three to six days. Kolmer found that basophilic stippling occurred in twenty-four hours, and that practically no cells remained in two weeks. Platelets disappear more rapidly than other living cells in preserved blood, being markedly deteriorated in twenty-four hours, according to Kolmer.

Other changes found in preserved blood are: decrease in glucose (Gwynn and Alsever, Jeanneney [169]), increase in phosphates (Balachovski and Guinsbourg), slow increase in nitrogen, increase in the serum potassium up to 1,000 per cent (Scudder et al.), diminution in sedimentation time, fall in respiratory capacity as the red blood cells are destroyed (Jeanneney [169]), and a rapid decrease in prothrombin (Rhoads and Panzer, Belk, Henry, and Rosenstein).

Because of the biological and chemical changes noted above, blood stored for more than a few days should be given only with the idea of supplying red blood cells, serum, and hemoglobin. Its chief use, therefore, is in cases of hemorrhage and shock (Kolmer, Fantus and Schirmer [108], Filatov and Doepp [114]). The value in cases of anemia, purpura, septicemia, and conditions with a high potassium value is questionable (Kolmer, Scudder et al., Belk et al. [25]).

The advantages of stored blood are obvious. It is readily available in large quantities, may be typed and serologically tested at leisure, and is suitable for transportation. The disadvantages of stored blood are equally clear. Early reports (Karavanov [183], Bagdassarov [12]) showed a very high incidence of reactions which is believed to be due to the long period of preservation (Wiener). More recent reports show a reaction rate comparable to fresh citrate transfusions (Meyer, Weissman, and Wilkey, Giddings and Kruger, Cameron and Ferguson [57]; Lundy, Tuohy, and Adams [223]; Barton and Hearne). Fox and Belk, Henry, and Rosenstein [25] have recently reported an increased incidence of apparently harmless hemoglobinuria and jaundice.

For the small hospital the preservation of blood is impractical, as blood lost because of hemolysis and the inability to maintain a sufficient quantity of all types make it very expensive (Belk et al., 25). Reports from small hospitals in the Chicago district have shown that at least 60 transfusions per month are necessary to maintain a successful blood bank. For such hospitals a list of professional donors residing near the hospital serves as a very satisfactory "human blood bank." Most authorities agree that fresh blood is more desirable but that preserved blood fulfills a need in institutions where fresh blood cannot be obtained readily (Mingazzini, Filatov [112], Kolmer, Belenkiy).

Plasma

Although not strictly within the scope of this paper, mention should be made of the recent uses found for blood serum or plasma. Methods for the collection and preservation of blood serum have been reported by Lehman, Burceva (53), Filatov and Kartasevskij (110); Tatum, Elliott, and Nesset; and Corelli. Some institutions with blood banks are siphoning off the blood plasma at the first indication of hemolysis and storing this plasma until needed. The successful use of serum or plasma in the treatment of operative or hemolytic shock was reported by Heinatz and Sokolow, Elliott (102), and Tatum, Elliott, and Nesset. Its use in burn shock has been mentioned previously. Many have also found it to be an effective hemostatic agent, equal to whole blood (Alovski, Burceva [53], Filatov et al. [110], Kayarnovskaya et al.).

The development of a method of obtaining a dry concentrated serum by evaporation at a low temperature has made available a substance readily soluble in water. Concentrated solutions of this evaporated "lyophile" serum have been used

effectively in the treatment of nephrosis (Aldrich, Stokes, Killingsworth, and McGuinness) to reduce intracranial pressure (Wright, Bond and Hughes [381]; Hughes, Mudd and Strecker), and experimentally in the treatment of animals in shock (Bond and Wright, Mahoney). Its use has been suggested in burns by Mahoney and Lehman.

Use of this concentrated serum for the purpose of increasing the agglutinin titer of serum for blood typing has been reported by Hoxworth and Mahoney.

It has been suggested that in case of war a center for the preparation and storage of blood plasma would be more valuable for use in emergencies than a blood preservation laboratory (Tatum, Elliott, and Nesset).

Placental Blood

Placental blood was first used by Robertson following the laboratory work of Rous and Turner (Barton and Hearne). Recent simplification of apparatus and investigation of its practicability have increased the interest and use of this source of blood (Bruskin and Farberova). Goodall (132) and his coworkers reported in 1938 that placental blood drained into a sterile flask containing an anticoagulant, typed, and preserved on ice could be used for transfusions. They believed that the high red blood count, the superior hemostatic power, and the absence of allergic reactions made this source of blood a valuable one. The average yield from each placenta was 120 c.cm. Most other authors have been unable to obtain such large quantities (Bruskin and Farberova, Page, Seager and Ward, Grodberg and Carey). Boland, Craig, and Jacobs, and Howkins and Brewer have found the amount obtainable too small to be practical. Goodall (132), and Gwynn and Alsever have found no appreciable contamination and believe any organisms present are attenuated by preservation at a low temperature. This work was not confirmed by Boland, Craig, and Jacobs, who found 30 per cent of their specimens contaminated, nor by Howkins and Brewer, 22 per cent of whose specimens were contaminated. Barton and Hearne make broth cultures when the blood is collected and use only those specimens showing no contamination. Disease in the mother, rupture of the membranes as long as forty-eight hours previously, prematurity, and asphyxia pallida are considered contraindications to its use (Goodall [132]). Page, Seager, and Ward compared the red blood count on babies whose placentas had been drained with counts on controls, and could demonstrate no ill effects. Halbrecht, Gauthier, Keller and Limpach [187], Filippov, Morgantini et al., and Grodberg and Carey have used placental blood successfully. Grodberg and Carey found that the blood group in the mother varied from the placental blood in 33 per cent of the cases. They also stated that a serological test should be performed at the time of collection of the blood because of the report of a case in which syphilis was contracted at the seventh month of pregnancy. Goodall (133) has reported 300 transfusions with two reactions and states that the blood may be kept for four months without ill effects. Barton and Hearne have recorded reactions in only 4.6 per cent of 78 transfusions of placental blood.

Post-Mortem Blood

Shamov first experimentally transfused dogs with blood taken before ten hours post mortem. Following his work, Yudin (384, 385, 386) used this method clinically. He found that blood could be taken within from six to eight hours after death from patients dying suddenly of angina pectoris, electrical shock, hanging, and the like, and used for transfusions. Blood taken from the jugular vein of such cadavers clots, but in a few hours undergoes a liquefaction or fibrinolysis which makes anticoagulants unnecessary (Bogomolova and Kartanova, Yudin [384]). In 1938 Yudin (386) reported 2,000 transfusions of post-mortem blood with mild reactions in 5 per cent and 5 deaths all due to hemolytic transfusion reactions. Contamination of post-mortem blood does not occur *in vivo* in less than from six to eight hours after death (Yudin [385]). That red blood cells from such a source live in the recipient has been satisfactorily demonstrated by Kryukov and Krilova, who found transfused cadaver blood in the circulation of a patient with pernicious anemia seventy days after transfusion.

The advantages of this large and very cheap source of blood are obvious. Aside from the disadvantages mentioned for preserved blood regardless of its source, post-mortem blood offers offense only to the sensibilities. For this reason it is not being used today outside of Russia.

It has been suggested that all soldiers be branded with their type so that when one dies suddenly his blood may be obtained for his fellow soldiers (Apostoleanu).

Complications

Although careful adherence to the plan outlined above for the selection of a donor will aid materially in lessening the danger of transfusions, reactions do occur. These reactions may be manifest by hemolysis, fever, urticaria, pulmonary edema, or other somewhat rarer symptoms.

Reactions

Hemolytic reactions are the most frequent cause of death from blood transfusions. DeGowin (86) has reported 7 hemolytic reactions in 3,500 transfusions, Seggel (311) 7 cases in 2,105 transfusions, and Belk et al. (25), 3 cases in 4,000 transfusions. The cause of this most dreaded reaction is frequently the use of incompatible blood (Tzanck and Moline [359]; DeGowin [86], Liengme and Martinet, Margulies, Baker, Liège and Herr, Goldring and Graef). Bordley believes that definite compatibility of the blood has not been demonstrated in a single case of hemolytic reaction. Jones and Rathmell (176) reported 5,000 transfusions without a single hemolytic reaction in properly matched blood. Hemolytic reactions have been reported, however, which have followed transfusions of compatible blood (Pygott, Hansen-Pruss and Miller, Younge, Speidel, Sharpe and Davis, Littlefield, McCandless [241, 242], Sinclair, Dinkler, Goldring and Graef, Smith and Haman, Hemingway and Hemingway). No satisfactory means has been found to date of eliminating or explaining the mechanism of these reactions in compatible groups. The use of different subgroups is believed to increase the number of reactions, but fatalities did not occur in the series reported by Filatov and Blinov and Doepp (113). Belk (24) believes that cold agglutination may account for some intragroup incompatibilities.

Another cause of hemolytic reactions is said to be the use of the universal donor for transfusions. Hesse has collected 46 cases with hemolytic reactions in which an O donor was used, with 20 deaths resulting. Because of reports such as this, the term "dangerous universal donor" has become popular, and many warnings against the use of the O donor are found in the recent literature (Saye, Larson, DeGowin [85], Martin and Whyte, Wille-Baumkauff, Lescher). It is probable that some of these reactions may have been due to the presence of a weak A_2 agglutinin which was not detected in the donor. (Davidsohn [77], Tatum, Elliott, and Nesset). There are also some Type O donors whose agglutinin titer is very high (Hesse [158], Muller and Balgairies, DeGowin [85]). Hesse (158) has investigated 104 Type O donors and found that a large percentage of them agglutinated Type A or B cells in a titer of more than 1:32. He believes that agglutination in 1:16 or more may produce hemolytic shock. O donors are said to be more dangerous for A recipients than for other groups. Despite these reports, the use of O donors has been followed by no serious results in the hands of some authorities (Lundy [222, 223], Blain, Brines, Tzanck and Dreyfuss [356], Tatum, Elliott, and Nesset). Low titered O donors may be used without fear of reactions (Levine and Katzin).

Sensitization of a recipient by repeated transfusion may occur, especially when the same donor is used repeatedly (Plummer, Mosonyi, Neter), but reactions of this same type have been reported in the primary transfusion (Seggel [311]). Sensitization to the heterogenous factors M and N is believed to be of no importance in repeated transfusion (Blinov [33], Seggel [311]). Sensitization has been produced in dogs after repeated transfusions (Melnick, Burack, and Cowgill). The theory that hemolysis may occur without previous agglutination has been advanced, but no evidence is available to indicate that this is more than a rarity (Simonin [321]).

No relation between the quantity of blood transfused and the occurrence of these reactions was found by Goldring and Graef. McCandless (241) found that the amount of blood given in fatal cases varied from 230 to 1,000 c.cm., while the quantities in cases which recovered varied from 40 to 750 c.cm.

The pathogenesis of these reactions is not clear. Various theories have been elaborated to explain the symptoms and pathological findings. Baker reviews the subject and credits Yorke and Nauss with the first description of deposits of hemoglobin in the kidneys of rabbits after the intravenous injection of hemoglobin. The diet of these animals contained no green vegetables. Baker and Dodds demonstrated that hemoglobin deposits could be produced in the renal tubules of animals by the injection of solutions of hemoglobin only if the urine was acid. Bordley outlined four theories to account for the nephritis which frequently occurs: obstruction of the renal tubules by pigment deposits, anaphylaxis, metabolic disturbances affecting renal function, and toxic substances which damage the kidney. DeGowin (89, 90) and his coworkers were able to confirm the experimental work of Baker and Dodds. They found that in patients and in dogs the tubules of the kidney became obstructed by pigment casts in Henle's loops. There was a destructive process involving the epithelium of the convoluted tubules and an interstitial edema and necrosis of the central zones of the hepatic lobules. These findings were also noted by Goldring and Graef.

Petroff, Filatov, Bogomolova, and Stroikova (276) noted a shock-like state in animals following the intravenous injection of homologous hemolyzed blood. This was accompanied by a marked narrowing of the lumen of the renal and splenic

vessels and a dilatation of the capillaries. This constrictor action was also demonstrated by Wesselkin, Lindenbaum, and Kartasevskij, who showed that it was not prevented by decerebration, sectioning of the spinal cord, division of the splanchnic nerves, removal of the celiac ganglion, removal of the sympathetic trunks, or denervation of the kidney. Iljin produced renal failure similar to that noted clinically by injecting dogs with human blood. Petroff and Bogomolova (274) showed that this constriction of the renal artery could not be produced by heterogenous serum, but later the same workers (275) obtained a similar constriction by the injection of an aqueous suspension of white blood corpuscles. They believed the toxic effect was due to a histamine-like body. Jeanneney and Ringenbach (173) have found the density of the blood to be increased during this shock.

A similar pathological picture occurs in patients dying of blackwater fever (Blackie) and from reactions to stored blood which has been overheated (Wilson and Jamieson). These observations indicate that the symptoms are due to the action of hemolyzed blood.

Symptoms of a hemolytic reaction may be immediate with shock, cyanosis, rapid pulse, severe pain in the lumbar region, restlessness, dyspnea, cough, and vomiting (Tzanck and Moline [359]). None of these symptoms may occur and this is said to be particularly likely if the reaction is due to the use of a universal donor (Wiener). Death may supervene immediately but usually does not. A chill and fever may occur from thirty minutes to one hour after transfusion and may be the first indication of a reaction. Within one minute after the onset of symptoms (Oehlecker), a hemoglobinemia and a hemoglobinuria may be found. A transient jaundice may occur. After the first symptoms the patient may recover completely without further disturbances, and this is said to occur in from 35 to 50 per cent of such reactions.

In the majority of cases a period of apparent improvement is followed by signs of renal insufficiency with oliguria or anuria, nitrogen retention, and signs of developing uremia. Death may then follow in from four to twelve days with edema, coma, and convulsions (DeGowin [86], Tzanck and Moline [359], Goldring and Graef). In other patients, a marked diuresis presages subsidence of the symptoms and complete recovery. The longest oliguria on record with recovery is sixteen days (Goldring and Graef). The mortality was found by McCandless (241) to be 62 per cent in 29 cases collected from the literature. Liège and Herr, and Bordley have reported similar findings.

The treatment is unsatisfactory after symptoms have developed. The transfusion should be stopped immediately and the shock is treated by the usual methods. DeGowin (86) believes that the urine of all patients should be alkalinized before transfusions because this has offered protection to dogs experimentally. An attempt should be made to produce a diuresis by the injection of glucose. Hesse and Filatov (159) have demonstrated experimentally that the immediate administration of a compatible transfusion produces relaxation of the constricted renal artery. They have reported recovery in 14 of 16 cases thus treated. Margulies and Simonin (321) have reported favorably on this treatment. Heinatz and Sokolow reported 7 recoveries among 10 cases following the use of conserved plasma. These results await further confirmation. Bancroft has reported recovery following decapsulation of the kidneys.

Careful typing, cross-matching, and alkalization of the urine before transfusion offer the best preventive measures at present.

Pulmonary edema is a serious and sometimes fatal transfusion reaction which occurs in patients with a well developed or incipient cardiac decompensation. A number of deaths have been reported (Plummer, Pygott, Brines, DeGowin [86]). To prevent this serious reaction, many authors prohibit the use of blood in cases of cardiac decompensation, while others believe that there is less danger in giving the blood slowly over a number of hours (Riddell).

Febrile reactions occur from thirty minutes to one hour following blood transfusion and are usually preceded by a chill. These reactions have been shown by Lewisohn and Rosenthal (214) to be due to foreign substances in the transfusion apparatus. The simple expedient of washing the apparatus carefully with distilled water after each use reduced the number of reactions in their experience from 12 to 1 per cent. New apparatus is prepared by boiling rubber goods in 1 per cent sodium hydroxide for five minutes and then rinsing in distilled water thoroughly. Similar results have been reported by other workers (Wood, Lescher; Fantus, Seed, and Schirmer [109], Filatov, Blinov, and Doepp [113]; Liengme and Martinet). These reactions, though very unpleasant, are not serious and subside promptly within a few hours. Symptomatic treatment only is necessary.

Allergy. The most common allergic reaction is manifested by an urticaria which is often extensive. This is probably due to sensitivity of the patient to food recently taken by the donor (Littlefield, Wiener, Price). These symptoms are

usually completely relieved by from 0.5 to 1 c.cm. of adrenalin (1:1000), and generally can be prevented by using fasting donors. Hancock reported a fatal reaction he believed to be due to an allergic reaction. Anaphylaxis is rare according to DeBakey (81). Passive transfer of the donor's sensitivity to a particular food has been reported. One patient had a persistent sensitivity to strawberries for three months after receiving blood from a sensitive donor (Holder and Diefenbach).

Uncommon reactions. Citrate was formerly severely indicted as a cause of reactions by Minot, Dodd, and Bryan, as well as others (Manheims, DeBakey [81], Franco). Lewisohn (213), Meleney, Levine and Katzin, and Albright have found the number of reactions occurring in citrate transfusions to be comparable with that of reactions following transfusions of unmodified blood.

Incipient coagulative changes have been mentioned as a cause of reactions but it is too vague a term to warrant discussion. It certainly plays no part in a properly performed transfusion.

Embolism is a rare complication (DeBakey [81]). An intracardiac thrombus has been reported (Rouffart-Marin). It is doubtful if air embolism ever occurs during transfusions, and Shulman and Glass state that it is harmless. DeBakey (81) has seen no air embolism in 5,000 transfusions.

Hemorrhage as a complication of blood transfusion occurs in blood dyscrasias. They may be gastro-intestinal, purpuric, or retinal (DeGowin [86]). Frey states that 60 cases of retinal hemorrhage following transfusion have been reported, 10 of them fresh. Of these 5 occurred in patients with a blood dyscrasia. Fatal intracranial hemorrhage has been reported in a baby during transfusion (Glaser, Epstein, and Landau).

Diseases

Various diseases have been transmitted by transfusion and constitute a real hazard in choosing a donor.

Syphilis. About 68 cases in which syphilis has been transmitted from the donor to the recipient have been collected from the literature, and many unreported cases undoubtedly exist (Rein, Wise, and Cukerbaum). Kast, Peterson, and Kolmer believe that it is relatively infrequent considering the number of transfusions given. These workers found that only 9.5 per cent of professional donors had a positive serological test.

It is known that not all syphilitics are capable of transmitting the disease. Donors in the early stages of the disease are said to be more dangerous than those in a latent stage. Jones, Rathmell, and Wagner (177) reported the use of 4 syphilitic donors only one of whom transmitted the disease. On the other hand, a donor may acquire syphilis and transmit the disease by a blood transfusion before the appearance of a primary lesion (McCluskie). Most authors believe that all syphilitics are potential transmitters, and that they should never be used as donors. The incubation period of transfusion syphilis is from one to four months, and the disease usually makes its appearance in the form of secondary lesions (Klauder and Butterworth).

Although a history does not exclude syphilis, even if data so obtained could be relied upon, some donors may be excluded in this manner (Willis, Ronchese). A physical examination should be performed with particular reference to new or old luetic lesions (Ronchese, Salkind). Following reports that the sensitivity of the precipitin tests is greater than that of the Wassermann reaction, the Kline test has been recommended (Straus; Rein, Wise, and Cukerbaum; Klauder and Butterworth). This test has the additional advantage of being easily performed in about thirty minutes so that it may be done preceding each transfusion. A combination of the history, physical examination, and Kline test gives the maximum protection from syphilis (Rein, Wise, and Cukerbaum, Stetten). In the absence of a serological examination various drugs have been added to the blood to kill the treponemas present (Organesyan, Salkind, and Kudrjavceva [267, 268]). Ackermann and Protasov suggested that neoarsphenamine be added to the blood to protect the donor from syphilis. Kast, Peterson, and Kolmer demonstrated that the addition of neoarsphenamine to blood in quantities of 10 mgm. per 100 c.cm. of blood, completely destroys treponemas if allowed to stand fifteen minutes at room temperature.

Malaria. According to Wright (382), who has reviewed the literature, the first case of transmission of malaria by transfusion was reported by Woolsey in 1911. Since this time Wright has collected 29 cases from the literature. To eliminate this danger a number of criteria have been suggested. The examination of blood smears from donors is unreliable. The period of latency in the donor is no protection for a case has been reported twenty-five years after the original infection (McCulloch). It has been advised that the history of infection be used to exclude malarial donors (Zussman and Silver, DeBakey [81]). Thomas, Keys, and Dyke reported a case in which no malarial history was obtainable, but in which the donor had been in India. On the

basis of this report, Wright (382) states that all donors who have lived in a malarial country should be excluded. DeBakey (81), however, states that in more than 5,000 transfusions which he has given or supervised in New Orleans, he has excluded donors on the basis of their history, and has had no cases in which malaria was transmitted.

Other diseases which have been reported as being transmitted by transfusion are measles, influenza, small pox, septicemia, bronchial asthma, allergy, typhoid fever (DeBakey [81], Wiener), and encephalitis (Beckman).

BIBLIOGRAPHY

1. Ackermann, V., and Protasov, N. Deutsche Ztschr. f. Chir., 1935, 245: 508.
2. Acuna, M., and Fernandez, D. Arch. argent. de pediat., 1938, 9: 585.
3. Albright, H. L. Surg. Clin. North Am., 1935, 15: 1561.
4. Aldrich, C. A., Stokes, J., Jr., Killingsworth, W. P., and McGuinness, A. C. J. Am. M. Ass., 1938, 111: 129.
5. Alovksi, A., and Burceva, E. Monatsschr. f. Geburtsh. u. Gynaek., 1937, 105: 38.
6. Andreev, F. F. Khirurgiya, 1938, 9: 147.
7. Apostoleanu, V. Rev. san. mil., Bucureşti, 1937, 36: 251.
8. Arborelius, M. Acta med. Scand., Supp., 1938, 89: 282.
9. Arena, J. M. Am. J. Dis. Child., 1937, 54: 23.
10. Arev, T. J. Vestnik khir., 1938, 55: 689.
11. Bacon, D. K. Minnesota Med., 1935, 18: 30.
12. Bagdassarov, A. Sang., 1937, 11: 466.
13. Bagdassarov, A., German, C., Gutson, G., and Zoubelivitsch, M. Acta med., U. S. S. R., 1938, 1: 497. Abstract J. Am. M. Ass., 1939, 112: 2575.
14. Baker, S. L. Lancet, 1937, 1: 1390.
15. Balachovski, S., and Guinsbourg, F. Sang, 1934, 8:622.
16. Bancroft, F. W. Ann. Surg., 1925, 81: 733.
17. Barton, F. E., and Hearne, T. M. J. Am. M. Ass., 1939, 113: 1475.
18. Bates, R. R. Surg., Gynec. & Obst., 1937, 65: 545.
19. Battaglia, A. and Tropeano, A. Rev. méd-quirurg. de patol. femenina, 1939, 7: 411.
20. Bauer, I. Deutsche med. Wchnschr., 1938, 64: 1064.
21. Baxter, E. H., and Everhard, M. J. J. Pediat., 1938, 12: 357.
22. Beckman, T. M. Acta chir. Scand., 1935, 76: 615.
23. Belenkiy, D. N. Sovet. khir., 1936, No. 3, p. 394. Abstract in J. Am. M. Ass., 1937, 108: 161.
24. Belk, W. P. Am. J. M. Sc., 1936, 191: 827.
25. Belk, W. P., Henry, N. W., and Rosenstein, F. Am. J. M. Sc., 1939, 198: 631.
26. Biddle, and Langley. Brit. M. J., 1939, 1: 555.
27. Black, K. O. Lancet, 1937, 2: 1430.
28. Black, M. D. Brit. M. J., 1937, 1: 903.
29. Blackie, W. K. Lancet, 1937, 2: 1124.
30. Blain, A. W. Ann Surg., 1929, 89: 917.
31. Blanchard, K., and Bell, H. O. J. Med. Soc. N. Jersey, 1934, 31: 559.
32. Blinov, N. Deutsche Ztschr. f. Chir., 1934, 243: 400.
33. Idem. Muenchen. med. Wchnschr., 1935, 82: 1904.
34. Blumberger, K. Med. Klin., 1938, 34: 805.
35. Blumberger, L. Muenchen. med. Wchnschr., 1935, 82: 2023.
36. Bock, A. V. New England J. Med., 1936, 215: 421.
37. Bock, H. E. Fortschr. d. Therap., 1937, 13: 537.
38. Bogomolova, L., and Kartanova, A. Zentralbl. f. Chir., 1936, 63: 448.
39. Boland, C. R., Craig, N. S., and Jacobs, A. L. Lancet, 1939, 1: 388.
40. Boller, R., and Falta, W. Klin. Wchnschr., 1934, 13: 1188.
41. Bond, D. D., and Wright, D. G. Ann. Surg., 1938, 107: 500.
42. Boon, T. H. Brit. M. J., 1938, 2: 1041.
43. Bordley, J. Arch. Int. Med., 1931, 97: 288.
44. Bourgault, E. J. de l'Hôtel-Dieu de Montréal, 1936, 5: 200.
45. Boycott, A. E., and Oakley, C. L. J. Path. & Bacteriol., 1934, 38: 91.
46. Bradford, W. H. Texas State J. M., 1934, 30: 352.
47. Brady, J. P. U. S. Nav. M. Bull., 1939, 37: 131.
48. Brewer, H. F. Brit. M. J., 1938, 1: 241.
49. Idem. Post-Grad. M. J., 1938, 14: 23.
50. Brines, O. A. J. Am. M. Ass., 1930, 94: 1114.
51. Bruskin, Y. M., and Farberova, P. S. Sovet. vrach. zhur., 1936, No. 20, p. 1546.
52. Burceva, E. Arch. f. klin. Chir., 1935, 181: 193.
53. Ibid., 182: 710.
54. Cadham, F. Canadian M. Ass. J., 1938, 38: 465.
55. Idem. Am. J. M. Sc., 1934, 188: 542.
56. Cameron, A. L. J.-Lancet, 1939, 59: 60.
57. Cameron, C. S., and Ferguson, L. K. Surgery, 1939, 5: 237.
58. Chvilivickij, T. Arch. f. klin. Chir., 1935, 181: 383.
59. Citron, J. J. Am. M. Ass., 1937, 108: 224.
60. Clausen, J. Acta path. et microbiol. Scand., Supp., 1938, 37: 134.
61. Clemens, J. Deutsche med. Wchnschr., 1938, 64: 1043.
62. Clément, R. Presse méd., Par., 1938, 46: 459.
63. Collier, W. D. Ohio State M. J., 1938, 34: 1111.
64. Cooksey, W. B. J. Michigan State M. Soc., 1937, 36: 753.
65. Ibid., 1939, 38: 409.
66. Corelli, F. Minerva med., 1939, 30: 373.
67. Corwin, E. H. L. New York State J. M., 1935, 35: 317.
68. Costa, A. O. T. Semana méd., 1936, 43: 783.
69. Cotter, J., and MacNeal, W. J. Proc. Soc. Exper. Biol. & Med., 1938, 38: 757.
70. Creed, E. F. Med. Press, 1938, 197: 462.
71. Creswell, S. M., and Wallace, C. E. J. Am. M. Ass., 1936, 106: 1384.
72. Crocker, W. J., Valentine, E. H., and Brody, W. J. Lab. & Clin. M., 1934, 20: 482.
73. Cubitt, A. W. Lancet, 1937, 1: 864.
74. Culbertson, C. G., and Ratcliffe, A. W. Am. J. M. Sc., 1936, 192: 471.
75. Davidsohn, I. Am. J. Clin. Path., 1938, 8: 179.
76. Idem. J. Am. M. Ass., 1939, 112: 713.
77. Davis, L. E., and Cushing, H. Surg., Gynec. & Obst., 1925, 40: 310.
78. DeBakey, M. J. Trop. M., 1937, 40: 137.
79. Idem. Am. J. Surg., 1935, 27: 85.
80. DeBakey, M., and Honald, E. Internat. M. Digest, 1938, 33: 301.
81. Ibid., p. 367.
82. Ibid., 1939, 34: 49.
83. Debré, R., Lamy, M., and Sée, G. Nourisson, 1937, 25: 337.
84. Deglmann, T. Deutsche med. Wchnschr., 1937, 63: 1694.
85. DeGowin, E. L. J. Am. M. Ass., 1937, 108: 296.

86. Idem. Ann. Int. Med., 1938, 11: 1777.
87. Idem. J. Iowa State M. Soc., 1938, 28: 57.
88. DeGowin, E. L., Harris, J. E., and Plass, E. D. Proc. Soc. Exper. Biol. & Med., 1939, 40: 126.
89. DeGowin, E. L., Osterhagen, H. F., and Andersch, M. Arch. Int. Med., 1937, 59: 432.
90. DeGowin, E. L., Warner, E. D., and Randall, W. L. Arch. Int. Med., 1938, 61: 609.
91. Dekkers, H. J. N. Acta med. Scand., 1939, 99: 587.
92. DeKlein, W. J. Am. M. Ass., 1938, 111: 2101.
93. Dieckmann, W. J., and Daily, E. F. Am. J. Obst. & Gynec., 1935, 30: 1.
94. Dinkler, G. Ztschr. f. klin. Med., 1938, 134: 385.
95. Doepp, M. Deutsche Ztschr. f. Chir., 1934, 243: 736.
96. Douglass, L. H., and Laughlin, K. Am. J. Obst. & Gynec., 1939, 37: 282.
97. Dyke, S. C. Lancet, 1937, 1: 1538.
98. Dyson, C. B., and Miller, R. Lancet, 1934, 1: 391.
99. Eddy, J. P., III. Rhode Island M. Journal, 1935, 18:150.
100. Ehrhardt, K., and Winkler, H. Deutsche med. Wchnschr., 1935, 61: 127.
101. Elliott, G. A., McFarlane, R. G., and Vaughn, J. M. Lancet, 1939, 1: 384.
102. Elliott, J. South. M. & S., 1936, 98: 643.
103. Emile-Weil, P., and Scemana. Sang, 1936, 10: 525.
104. Erbsloeh, J. Monatsschr. f. Geburtsh. u. Gynaek., 1936, 101: 156.
105. Erikson, E. W. Hosp. Management, 1939, 47: 19.
106. Ibid., 1940, 49: 19.
107. Fantus, B. J. Am. M. Ass., 1937, 109: 128.
108. Fantus, B., and Schirmer, E. J. Am. M. Ass., 1938, 111: 317.
109. Fantus, B., Seed, L., and Schirmer, E. Arch. Path., 1938, 26: 160.
110. Filatov, A., and Kartasevskij, N. Zentralbl. f. Chir., 1935, 62: 441.
111. Filatov, A., Majanc, J., Kartasevskij, N., and Doepp, M. Beitr. z. klin. Chir., 1935, 161: 309.
112. Filatov, A. N. Vestnik khir., 1937, 51: 194. Abstract in J. Am. M. Ass., 1937, 109: 1410.
113. Filatov, A. N., Blinov, N., and Doepp, M. Arch. f. klin. Chir., 1936, 184: 647.
114. Filatov, A. N., and Doepp, M. E. Vestnik khir., 1935, 39: 36. Abstract in J. Am. M. Ass., 1936, 106: 84.
115. Filippov, P. L. Vestnik khir., 1939, 57: 522.
116. Fischer, R. Rev. méd. de la Suisse Rom., 1939, 59: 513.
117. Fonio, A. Schweiz. med. Wchnschr., 1936, 66: 337. Abstract in J. Am. M. Ass., 1936, 106: 2113.
118. Fourestier, M., and Paillas, J. P. Ann. méd-chir., Par., 1938, 3: 207.
119. Fox, H. Pennsylvania M. J., 1939, 43: 49.
120. Franco, J. F. Medicina, Mexico, 1937, 17: 84.
121. Frey, W. G. Am. J. Ophth., 1938, 21: 491.
122. Frsanowich, A. L. Vestnik khir., 1938, 55: 527.
123. Gauthier, P. J. de l'Hôtel-Dieu de Montréal, 1938, 7: 251.
124. Gay, C. H. South. M. & S., 1936, 98: 418.
125. Giddings, E., and Kruger, A. W. Hospitals, 1939, 13: 41.
126. Gill, E. G. Tr. Sect. Laryngol., Otol. & Rhinol. Am. M. Ass., 1937, p. 144.
127. Idem. Arch. Otolaryngol., 1938, 27: 67.
128. Glaser, J., Epstein, J., and Landau, D. B. Am. J. Dis. Child., 1937, 53: 794.
129. Gnoinski, H. Sang, 1938, 12: 820.
130. Gohrbandt, E. Deutsche Ztschr. f. Chir., 1937, 249: 501.
131. Goldring, W., and Graef, I. Arch. Int. Med., 1936, 58: 825.
132. Goodall, J. R., Anderson, F. O., Altimas, G. T., and MacPhail, F. L. Surg., Gynec. & Obst., 1938, 66: 176.
133. Idem. Mod. Hosp., 1938, 51: 44.
134. Gosio, R. Policlin., Rome, 1938, 45: sez. med. 285.
135. Gosselin, O. Bruxelles-méd., 1935, 15: 635.
136. Goudim-Levkovitsch, D. A. Gynéc. et obst., 1936, 33: 507.
137. Govaerts, J. Bruxelles-méd., 1934, 14: 956.
138. Grimberg, A. Presse méd., Par., 1939, 47: 611.
139. Grimberg, A., and Krauss. Presse méd., Par., 1939, 47: 158.
140. Grodberg, B. C., and Carey, E. L. New England J. Med., 1938, 219: 471.
141. Gwynn, C. A., and Alsever, J. B. Am. J. M. Sc., 1939, 198: 634.
142. Habel, K., and Crocker, W. J. J. Pediat., 1936, 9: 149.
143. Haden, R. L. Med. Clin. North Am., 1936, 19: 1977.
144. Idem. Surg. Clin. North Am., 1937, 17: 1511.
145. Hajek, O. Med. Klin., 1934, 30: 639.
146. Halbrecht, J. Lancet, 1939, 1: 202.
147. Hall, H. Mod. Hosp., 1938, 51: 62.
148. Hamilton, P. M. California & West. Med., 1937, 46: 245.
149. Hancock, J. D. South. Surgeon, 1937, 5: 373.
150. Hansen-Pruss, O. C., and Miller, B. N. South. M. J., 1936, 29: 1033.
151. Hashinger, E. H. and Simon, J. F. J. Lab. & Clin. M., 1934, 20: 231.
152. Hedenius, P. Acta med. Scand., 1936, 89: 263.
153. Idem. Lancet, 1937, 2: 1186.
154. Heim, W. Muenchen. med. Wchnschr., 1938, 85: 1157.
155. Heinatz, S. W., and Sokolow, N. I. Zentralbl. f. Chir., 1935, 62: 1753.
156. Hemingway, M. W., and Hemingway, R. W. Northwest Med., 1937, 36: 53.
157. Herrell, W. E. Proc. Staff Meet., Mayo Clin., 1938, 13: 261.
158. Hesse, E. Deutsche Ztschr. f. Chir., 1935, 245: 371.
159. Hesse, E. P., and Filatov, A. N. Zentralbl. f. Chir., 1932, 59: 2674.
160. Holder, H. G., and Diefenbach, W. E. California & West. Med., 1932, 37: 387.
161. Horton, B. T., and Watkins, C. H. Proc. Staff Meet., Mayo Clin., 1933, 8: 288.
162. Howkins, J., and Brewer, H. F. Lancet, 1939, 1: 132.
163. Hoxworth, P., and Mahoney, E. J. Am. M. Ass., 1938, 111: 1554.
164. Hughes, J., Mudd, S., and Strecker, E. A. Arch. Neurol. & Psychiat., 1938, 39: 1277.
165. Hulst, L. A., and Hartog, H. A. P. Nederl. Tijdschr. v. Geneesk., 1934, 78: 1849.
166. Hustin, A., and Dumont, A. Surg., Gynec. & Obst., 1939, 68: 940.
167. Iancu, A., and Opusiu, C. Monatsschr. f. Kinderh., 1938, 74: 209.
168. Iljin, W. Arch. f. klin. Chir., 1934, 181: 240.
169. Jeanneney, G. Bruxelles-méd., 1938, 18: 571.
170. Jeanneney, G., and Castanet, P. Paris méd., 1938, 2: 37.
171. Jeanneney, G., Castanet, P., and Cator, R. Bull. Acad. de méd., Par., 1938, 119: 760.
172. Jeanneney G., and Ringenbach, G. Mém. l'Acad. de chir., Par., 1938, 64: 546.
173. Idem. Compt. rend. Acad. d. sc., 1938, 206: 1925.

174. JEANNIN, C., and CHOMÉ, E. Bull. Acad. de méd., Par., 1934, 111: 780.
175. JENNINGS, W. K. Surg. Clin. North Am., 1938, 18: 145.
176. JONES, H. W., and RATHMELL, T. K. Surg. Clin. North Am., 1936, 16: 605.
177. JONES, H. W., RATHMELL, T. K., and WAGNER, C. Am. J. Syph. & Neurol., 1935, 19: 30.
178. JORDA, F. D. Lancet, 1939, 1: 773.
179. JORDA, F. D., and ALEU, E. M. Rev. san. de guerra, Barcelona, 1037.
180. JUDD, E. S., SNELL, A. M., and HOERNER, M. T. J. Am. M. Ass., 1935, 105: 1653.
181. KAMMERER, H. Deutsche med. Wchnschr., 1938, 64: 773.
182. KARAVANOV, G. Sang, 1935, 9: 709.
183. Idem. Vrach. delo, 1935, 18: 131.
184. KAST, C. C., PETERSON, C. W., and KOLMER, J. A. Am. J. Syph., Gonor. & Ven. Dis., 1939, 23: 150.
185. KAYARNOVSKAYA, O. S., and MORDVINKINA, V. I. Problemy Tuberkuleza, 1936, p. 973. Abstract in J. Am. M. Ass., 1936, 107: 1598.
186. KAYNE, G. G. Lancet, 1934, 1: 1338.
187. KELLER, R., and LIMPACH, J. Gynéc. et obst., 1938, 37: 173.
188. Idem. Rev. franç. de gynéc. et d'obst., 1939, 34: 129.
189. KILGORE, E. Am. Heart J., 1937, 13: 619.
190. KLAUDER, J. V., and BUTTERWORTH, T. Am. J. Syph., Gonor. & Ven. Dis., 1937, 21: 652.
191. KNAUS, H. Arch. f. Gynaek., 1938, 166: 404.
192. KNOFLACH, J. G. Med. Klin., 1938, 34: 365.
193. KNOLL, H., and SCHUERCH, O. Lancet, 1938, 1: 1387.
194. KOENEN, H. P. J., and VONK, J. M. M. Maandschr. v. Kindergeneesk., 1937, 6: 320. Abstract in J. Am. M. Ass., 1937, 109: 178.
195. KOGAN, O. Khirurgiya, 1938, 12: 26.
196. KOLMER, J. A. Am. J. M. Sc., 1939, 197: 442.
197. KOTTKE, E. E. J. Iowa State M. Soc., 1934, 24: 431.
198. KRIAJIMSKI, E. V. Khirurgiya, 1938, 7–8: 48.
199. KRIZHEVSKY, J. O. Rev. de la tuberculose, Par., 1937, 3: 1162. Abstract in J. Am. M. Ass., 1938, 110: 1237.
200. KRYUKOV, A., and KRILOVA, L. Sang, 1935, 9: 692.
201. KUSKE, H. Schweiz. med. Wchnschr., 1935, 65: 1025.
202. KUTSCHA-LISSBERG, E. Wien. klin. Wchnschr., 1934, 47: 586.
203. LAINER, F. Klin. Wchnschr., 1937, 16: 1435.
204. LANDSTEINER, K., and LEVINE, P. Proc. Soc. Exper. Biol. & Med., 1927, 124: 941.
205. LANTIN, P. T., and GUERRERO, F. S. Am. J. M. Sc., 1936, 191: 850.
206. LARDERICH, L., MAMOU, H., and BEAUCHESNE, H. Paris méd., 1934, 2: 277.
207. LARSON, E. M. J. Iowa State M. Soc., 1937, 27: 259.
208. LEDERER, M. Am. J. M. Sc., 1930, 179: 228.
209. LEHMAN, E. P. J. Am. M. Ass., 1939, 112: 1406.
210. LESCHER, F. G. Clin. J., 1937, 66: 496.
211. LEVIN, O. A., and KARTASEVSKIJ, N. Deutsche Ztschr. f. chir., 1936, 246: 501.
212. LEVINE, P., and KATZIN, E. M. J. Am. M. Ass., 1938, 110: 1243.
213. LEWISOHN, R. Ann. Surg., 1937, 105: 602.
214. LEWISOHN, R., and ROSENTHAL, N. J. Am. M. Ass., 1933, 100: 466.
215. LIÈGE, R., and HERR, A. Ann. de méd., 1933, 34: 398.
216. LIENGME, A., and MARTINET, R. Rev. méd. de la Suisse Rom., 1937, 57: 625.
217. LIPPARD, V. W., and JOHNSON, P. Am. J. Dis. Child., 1935, 49: 1430.
218. LITTLEFIELD, J. B. Southwest. Med., 1934, 18: 52.
219. LORETI, M. Riforma med., 1937, 53: 1607.
220. LUNDY, J. S., and OSTERBERG, A. E. Surgery, 1937, 2: 590.
221. LUNDY, J. S., TOVELL, R. M., and TUOHY, E. B. Proc. Staff Meet., Mayo Clin., 1936, 11: 421.
222. LUNDY, J. S., TUOHY, E. B., and ADAMS, R. C. Proc. Staff Meet., Mayo Clin., 1937, 12: 225.
223. Ibid., 1938, 13: 177.
224. LUNDY, J. S., TUOHY, E. B., ADAMS, R. C., and MOUSEL, L. H. Proc. Staff Meet., Mayo Clin., 1939, 14: 273.
225. LYNCH, M. G. New Orleans Med. & Surg. J., 1938, 91: 89.
226. LYONS, C. J. Am. M. Ass., 1935, 105: 1972.
227. MACNAB, G. H. Brit. M. J., 1936, 1: 71.
228. MACNEAL, W. J., and NEIL, M. E. J. Lab. & Clin. M., 1937, 22: 842.
229. MAHONEY, E. B. Ann. Surg., 1938, 108: 178.
230. MAISONNET, M., and JEANNENEY, G. Mém. l'Acad. de chir., Par., 1938, 64: 1000.
231. MAJANZ, J. Zentralbl. f. Chir., 1935, 62: 2773.
232. MANHEIMS, P. J. Med. Rec., New York, 1939, 149: 78.
233. MARGULIES, H. Zentralbl. f. Chir., 1934, 61: 1757.
234. MARIE, J., and BOUTET, A. Paris méd., 1938, 2: 342.
235. MARINESCO, G. Bull. Acad. de méd., Par., 1938, 119: 193.
236. MARRIOTT, H. L., and KEKWICK, A. Lancet, 1935, 1: 977.
237. Idem. Proc. Roy. Soc. Med., Lond., 1936, 29: 337.
238. MARTIN, H. E., and WHYTE, R. Am. J. Surg., 1936, 32: 439.
239. MARTIN, J. W., and MYERS, J. T. J. Lab. & Clin. M., 1935, 20: 593.
240. MATHIESON, D. R., and WATSON, B. H. J. Am. M. Ass., 1939, 112: 308.
241. MCCANDLESS, H. G. J. Am. M. Ass., 1935, 105: 952.
242. Idem. J. Med., Cincinnati, 1936, 17: 28.
243. MCCLENDON, S. J. Arch. Pediat., 1935, 52: 830.
244. MCCLUSKIE, J. A. W. Brit. M. J., 1939, 1: 264.
245. MCCULLOCH, E. Canadian M. Ass. J., 1937, 37: 26.
246. MELENEY, H. E., STERNES, W. W., FORTUNE, S. T., and FERRY, R. M. Am. J. M. Sc., 1917, 154: 733.
247. MELNICK, D., BURACK, E., and COWGILL, G. R. Proc. Soc. Exper. Biol. & Med., 1936, 33: 616.
248. MERKLEN, P., ISRAEL, L., and APFFEL, A. Presse méd., Par., 1936, 44: 1941.
249. MEYBOOM, C. Muenchen. med. Wchnschr., 1937, 84: 1618.
250. MEYER, K. A., WEISSMAN, L. H., and WILKEY, J. L. Hospitals, 1938, 12: 79.
251. MINGAZZINI, I. Gazz. d. osp., Milan, 1938, 59: 1011. Abstract in J. Am. M. Ass., 1938, 111: 2249.
252. MINOT, A. S., DODD, K., and BRYAN, R. Am. J. Dis. Child., 1933, 45: 32.
253. MITCHINER, P. H., and COWELL, E. M. Lancet, 1939, 1: 228.
254. MORELL, T. Deutsche med. Wchnschr., 1938, 64: 1356.
255. MORGANTINI, H., SARAVI, M. S., and BALAGUER, M. Rev. méd. d. Rosario, 1938, 28: 1321.
256. MOSENTHAL, H. O., and ASHE, B. Am. J. M. Sc., 1930, 180: 476.
257. MOSONYI, L. Klin. Wchnschr., 1936, 15: 1675.
258. MOUREAU, P., BALGAIRIES, E., and CHRISTIAENS, L. Presse méd., Par., 1938, 49: 958.
259. MULLER, M., and BALGAIRIES, E. Compt. rend. Soc. de biol., 1936, 121: 1447.
260. MURANO, G. Pediatria, Naples, 1937, 45: 765. Abstract in J. Am. M. Ass., 1937, 109: 1320.

261. Neff, F. C., Fredeen, R. C., and Herrman, G. V. J. Kansas M. Soc., 1936, 37: 416.
262. Nelson, E. Hosp. Management, 1939, 47: 16.
263. Neter, E. J. Immunol., 1936, 30: 255.
264. Niederle, B. Časop. lék. česk., 1937, 76: 1197.
265. Oehlecker, F. Die Bluttransfusion. Vienna: Urban & Schwarzenberg, 1933. Quoted by Wiener, A. S.: Blood Groups and Blood Transfusion. Springfield, Illinois: Chas. C. Thomas, 1939.
266. Oliver, P. L. Brit. M. J., 1936, 2: 1032.
267. Organesyan, P., Salkind, E. S., and Kudrjavceva, V. Zentralbl. f. Chir., 1934, 61: 2144.
268. Ibid., 1935, 62: 1513.
269. Osgood, E. E., and Ashworth, C. M. Atlas of Hematology. San Francisco: J. W. Stacey, Inc., 1937.
270. Page, A. P. M., Seager, K. G., and Ward, E. M. Lancet, 1939, 236: 200.
271. Paliquin, P. A. L'Union médicale du Canada, 1937, 66: 381.
272. Parker, A. P. Pennsylvania M. J., 1935, 38: 324.
273. Patton, P. B. Am. J. Clin. Path., Tech. Supp., 1938, 2: 178.
274. Petroff, J., and Bogomolova, L. Arch. f. klin. Chir., 1936, 184: 522.
275. Ibid., 1937, 188: 65.
276. Petroff, J., Filatov, A., Bogomolova, L., and Stroikova, X. Arch. f. klin. Chir., 1934, 181: 209.
277. Piercy, F. F. Ohio State M. J., 1936, 32: 528.
278. Pierre-Bourgeois, H., Gisselbresch, H., and Commerson-Teyssier, S. Rev. de la tuberculose, Par., 1937, 3: 150. Abstract in J. Am. M. Ass., 1937, 108: 1926.
279. Plummer, N. S. Brit. M. J., 1936, 2: 1186.
280. Poston, M. A., and Menefee, E. E. New England J. Med., 1938, 219: 796.
281. Price, A. S. Rev. Gastroenterol., 1934, 1: 192.
282. Prioleau, W. H. J. Pediat., 1937, 11: 568.
283. Pygott, F. Brit. M. J., 1937, 1: 496.
284. Quick, A. J., Stanley-Brown, M., and Bancroft, F. W. Am. J. M. Sc., 1935, 190: 501.
285. Rathmell, T. K., and Crocker, W. J. J. Lab. & Clin. M., 1934, 19: 1206.
286. Ravenna, P. Minerva med., 1938, 1: 622.
287. Rein, C. R., Wise, F., and Cukerbaum, A. R. J. Am. M. Ass., 1938, 110: 13.
288. Reiter, P. J. Ztschr. f. d. ges. Neurol. u. Psychiat., 1938, 160: 598.
289. Renton, M. W. Brit. M. J., 1934, 2: 470.
290. Rhoads, J. E., and Panzer, L. M. J. Am. M. Ass., 1939, 112: 309.
291. Riddell, V. Blood Transfusion. London: Oxford Univ. Press, 1939.
292. Ronchese, F. New England J. Med., 1939, 220: 556.
293. Rosenberg, L. C. J. Pediat., 1937, 10: 648.
294. Rosenthal, G. Paris méd., 1934, 2: 41.
295. Idem. Sang, 1934, 8: 740.
296. Rouffart-Marin, J. Bruxelles-méd., 1939, 19: 1090.
297. Ryss, S., and Stroikova, X. Arch. f. klin. Chir., 1937, 185: 38.
298. Sai, Gen-itiro. Tohoku J. Exper. Med., 1938, 33: 369.
299. Salkind, E. Sang, 1936, 10: 997.
300. Saxton, R. S. Lancet, 1937, 2: 606.
301. Saye, E. B. J. Med. Ass. Georgia, 1938, 27: 143.
302. Scannell, J. M. Am. J. Surg., 1937, 36: 26.
303. Scherber, G. Wien. klin. Wchnschr., 1935, 48: 211.
304. Schiodt, E. Acta med. Scand., 1938, 95: 49.
305. Schlegel, M. Monatsschr. f. Kinderh., 1936, 64: 329.
306. Schmidt, W. Deutsche med. Wchnschr., 1936, 62: 881.
307. Schuerch, O. Helvet. med. acta, 1938, 5: 863.
308. Scudder, J., Drew, C. R., Corcoran, D. R., and Bull, D. C. J. Am. M. Ass., 1939, 112: 2263.
309. Seckel, H. Med. Klin., 1935, 31: 1603. Abstract in J. Am. M. Ass., 1936, 106: 425.
310. Sedallian, P., and Jourdan, F. Compt. rend. Soc. de biol., 1937, 124: 1119.
311. Seggel, K. A. Klin. Wchnschr., 1938, 17: 593.
312. Idem. Muenchen. med. Wchnschr., 1936, 83: 1129.
313. Shamov, W. N. Lancet, 1937, 2: 306.
314. Sharpe, J. C., and Davis, H. H. J. Am. M. Ass., 1938, 110: 2053.
315. Shea, J. J. Ann. Otol., Rhinol. & Laryngol., 1937, 46: 87.
316. Sherman, I. Am. J. Dis. Child., 1934, 47: 533.
317. Shipton, E. A., and Lawes, F. A. E. Med. J Australia, 1935, 2: 819.
318. Shulman, N., and Glass, F. A. J. Med. Soc. N. Jersey, 1937, 34: 555.
319. Sibley, W. L., and Lundy, J. S. Surg., Gynec. & Obst., 1938, 67: 490.
320. Silverman, D. N. New Orleans M. & S. J., 1937, 89: 545.
321. Simonin, C. Paris méd., 1935, 2: 529.
322. Idem. Presse méd., Par., 1936, 44: 1305.
323. Sinclair, A. S. Canadian M. Ass. J., 1936, 35: 423.
324. Sinek, F. Med. Klin., 1934, 30: 368.
325. Sköld, E. Acta med. Scand., 1936, 88: 450.
326. Smith, C. E., and Haman, J. O. California & West. Med., 1934, 41: 157.
327. Smith, H. O. Industrial Med., 1936, 5: 625.
328. Speidel, W. C. West. J. Surg., Obst. & Gynec., 1936, 44: 651.
329. Spiridonov, A. N. Klin. Med., 1936, 14: 1798. Abstract in J. Am. M. Ass., 1937, 108: 515.
330. Spivek, M. L. J. Pediat., 1935, 7: 199.
331. Springer, C. Med. Klin., 1938, 34: 647.
332. Stabler, F. J. Obst. & Gynaec. Brit. Emp., 1934, 41: 768.
333. Stahl, R. Med. Klin., 1935, 31: 1302.
334. Starlinger, F. Med. Klin., 1937, 33: 1710.
335. Stenström, T., and Gripwall, E. Acta med. Scand., Supp., 1938, 89: 201.
336. Stetson, R. E. Am. J. Surg., 1936, 33: 537.
337. Stetten, D. J. Am. M. Ass., 1938, 110: 1248.
338. Straus, R. Arch. Dermat. & Syph., 1937, 36: 1039.
339. Svejcar, J. Nourisson, 1939, 27: 32.
340. Tassovatz, B. Nourisson, 1937, 25: 358.
341. Tatum, W. L., Elliott, J., and Nesset, N. Mil. Surgeon, 1939, 85: 401.
342. Taylor, G. L., and Ikin, E. W. Brit. M. J., 1939, 1: 1027.
343. Terechova, A. A. Gynéc. et obst., 19 38, 37: 52.
344. Thelander, H. E. J. Pediat., 1934, 4: 75.
345. Thomas, W. L., Keys, S., and Dyke, S. C. Lancet, 1936, 1: 536.
346. Thompson, M. L. Arch. Dis. Child., 1935, 10: 109.
347. Tiber, L. J. California & Western Med., 1934, 41: 16.
348. Tinker, M. B., and Tinker, M. B., Jr. J. Am. M. Ass., 1939, 112: 2006.
349. Tretow, W. Zentralbl. f. Chir., 1937, 64: 2880.
350. Trusler, H. M., Egbert, H. L., and Williams, H. S. J. Am. M. Ass., 1939, 113: 2207.
351. Tuohy, E. B. Surgery, 1938, 4: 261.
352. Idem. Surg., Gynec. & Obst., 1938, 67: 510.
353. Turner, G., and Briesen, D. von. Southwest. Med., 1937, 21: 7.

354. TZANCK, A. Bull. et mém. Soc. méd. de hôp. de Par., 1934, 50: 535.
355. TZANCK, A., and ANDRE, R. Bull. et mém. Soc. méd. d. hôp. de Par., 1939, 55: 771.
356. TZANCK, A., and DREYFUSS, A. Bull. et mém. Soc. méd. d. hôp. de Par., 1938, 54: 609.
357. Idem. Sang, 1938, 12: 455.
358. TZANCK, A., and MARTINEAU, J. Bull. et mém. Soc. méd. d. hôp. d. Par., 1934, 50: 430.
359. TZANCK, A., and MOLINE, R. Paris méd., 1935, 2: 308.
360. VAN DAMME-GENT. Arch. f. Gynaek., 1933, 156: 393.
361. VIAU, H. L'Union médicale du Canada, 1938, 67: 170.
362. VLADOS, C. Sang, 1934, 8: 768.
363. VLADOS, C., and MEERSON, J. Sang, 1935, 9: 375.
364. VLADOS, K. Klin. Med., Moscow, 1937, 15: 1268. Abstract in J. Am. M. Ass., 1938, 110: 1242.
365. WALKER, M., and KING, E. O. Ann. Surg., 1936, 104: 475.
366. WALLINGFORD, A. J. New York State J. M., 1937, 37: 1922.
367. Idem. Am. J. Obst. & Gynec., 1937, 33: 869.
368. WALTERS, W. J. Am. M. Ass., 1938, 111: 2477.
369. WATSON, C. M., and WATSON, J. R. J. Am. M. Ass., 1936, 106: 520.
370. Idem. Am. J. Surg., 1936, 33: 232.
371. WENZEL, J. F., and HAMMER, H. J. Am. J. Surg., 1936, 34: 119.
372. WESSELKIN, F., LINDENBAUM, J., and KARTASEVSKIJ, N. Arch. f. klin. Chir., 1934, 181: 227.
373. WIENER, A. S. Blood Groups and Blood Transfusion. Springfield, Illinois: Chas. C. Thomas, 1939.
374. WILLE-BAUMKAUFF, H. Beitr. z. klin. Chir., 1938, 168: 23.
375. WILLIS, N. W. New York State Journal Med., 1937, 37: 60.
376. WILSON, T. I., and JAMIESON, J. M. M. Brit. M. J., 1938, 1: 1207.
377. WINTERTON, W. R. J. Obst. & Gynaec. Brit. Emp., 1937, 44: 510.
378. WOLFF, J. Monatsschr. f. Kinderh., 1938, 76: 30.
379. WOOD, I. Med. J. Australia, 1938, 1: 731.
380. WORONOW, N. Zentralbl. f. Chir., 1936, 63: 2789.
381. WRIGHT, D., BOND, D., and HUGHES, J. Arch. Neurol. & Psychiat., 1938, 39: 1288.
382. WRIGHT, F. H. J. Pediat., 1938, 12: 327.
383. YOUNGE, P. A. New England J. Med., 1936, 214: 879.
384. YUDIN, S. S. J. Am. M. Ass., 1936, 106: 997.
385. Idem. Lancet, 1937, 2: 361.
386. Idem. Vestnik khir., 1938, 55: 103.
387. ZINGHER, A. J. Am. M. Ass., 1924, 82: 1180.
388. ZUSSMAN, B., and SILVER, A. Med. Rec., New York, 1938, 148: 176.
389. ZYUKOV, A. M., SHEKHET, A. L., ZAVOYKO, V. O., and MESHCHERSKIY, V. N. Med. zhur., 1936, 6: 839. Abstract in J. Am. M. Ass., 1937, 108: 688.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Rapant, V.: The Importance of Arteriography in Emboli of the Arteries of the Extremities (Zur Bedeutung der Arteriographie bei Embolien der Extremitaetenarterien). *Chirurg*, 1939, 11: 584.

In spite of the essential advances that have been made in the surgery of emboli in the arteries of the extremities there have still remained some differential diagnostic and therapeutic difficulties. These difficulties are present especially when it is necessary to determine whether the ischemia of the extremities is produced by a classical embolus, whether it is due to a stormy course of an arterial thrombosis, or whether it is only an arterial spasm as a result of venous thrombosis in cases in which a so-called "maladie emboligène" is not present. In contrast to these deficiencies of the clinical diagnosis, arteriography shows not only the topical localization of the embolus and the severity of the mechanical interruption (complete or incomplete embolus), but also reveals an approximate picture of the collateral circulation and explains the condition of the blood vessel and of even the eventual organic changes in the same. Thus it also becomes a good guide for treatment. The author reports a few of his own observations.

Case 1. A woman, aged thirty-two years and suffering for sixteen years with dilatation of the veins, was attacked in the same leg with febrile thrombophlebitis. Under clinical treatment the symptoms receded rapidly except for a hard band, which remained slightly painful. A few days after dismissal from the hospital severe pains occurred suddenly in the entire left extremity during the night. The diagnosis was embolus of the femoral artery. The treatment with eupaverin and strophanthin with glucose was without result and, therefore, the patient was referred to the Surgical University Clinic of Bruenn. The signs of the disturbed blood circulation reached up to the upper third of the thigh, and they then receded slowly. The pulse was nowhere palpable in the vessels of the right leg. The skin felt cool; active movements were not possible and passive movements were associated with pain. These symptoms occurred first on the right side and later on the left. A bilateral arteriography with thorotrast was made and explained the condition after an exposure of the artery, carried out closely under Poupart's ligament, revealed a loss of pulse but no embolus at that site. The vessel was narrow and sinuous; parietal filling defects were present as in arteriosclerosis. The lancet-shaped ending of the filled popliteal artery, which extended up to the lower border of the tibial condyles, was striking and characteristic of spasm. There was an insufficient collateral circulation, but the signs (endarteritis) suggesting a chronic change of the vascular wall were absent. The diagnosis was incomplete embolus of the femoral artery with considerable vasoconstrictor resection of the vascular wall and incomplete collateral circulation. By means of arteriography of the exposed right femoral artery the vessel was found contracted and pulseless. The artery was filled with fluid blood, just as the popliteal artery, and both had smooth sharp edges. The anterior tibial artery could be followed up to the lowest portions of the lower leg, where it ended with a lancet shape. The posterior tibial artery narrowed rapidly toward the periphery and could be followed up to the internal malleolus. Its course was markedly sinuous. The roentgenogram thus definitely showed that there was a micro-embolus which proceeded rapidly toward the periphery and produced a marked vasoconstriction only in the region of the bitibial system. On the basis of the arteriography no intervention was attempted on the right side, but an embolectomy of the femoral artery with subsequent periarterial sympathectomy of the exposed portion of the vessel was done on the left side. The surgically removed embolus was 14 cm. long. In spite of the operation gangrene on the left side resulted and amputation was done on the third day, whereas the circulatory disturbances on the right side disappeared entirely after infiltration of the lumbar sympathetic nerve with novocaine.

Case 2. A woman, aged forty-two years, had never been sick before. In September, 1937, she had a febrile serous meningitis with slow recovery. On October 5, she felt severe pains in the left leg, which she could no longer lift. Eupaverin was without effect, and therefore she was referred to the hospital. The left lower leg and the knee showed a waxlike discoloration with numerous livid spots. These changes diminished rapidly above the knee. The pulse was not palpable and the skin temperature was cold. In the arteriogram the artery was well filled, and the popliteal artery was filled partially. There was no striking narrowing of the vessels. Their contours were sharp and smooth. The collateral circulation was relatively good and there were no organic changes. The section of the popliteal artery remained outside of the film, and the exposure was repeated with uroselectan after ten minutes. Shortly after the injection there were very severe pains in the entire leg with pale discoloration up to the hip. The patient could then suddenly flex the previously immobile leg, whereupon the pain soon eased and the leg assumed a distinctly bright red color, but this was less pronounced in the lower part. In an arteriogram taken then, the filling of the entire popliteal artery showed less contrast than in the former exposure, and the femoral and popliteal arteries had become narrower. The entire popliteal artery was filled up to the bifurcation. There was, therefore, an embolus above the bifurca-

tion of the posterior tibial artery, as the anterior tibial artery narrowed rapidly and its filling stopped at the border between the middle and upper third of the lower leg, while the posterior tibial artery was suddenly interrupted in its filling and ended in the form of a centrally convex arch. There was also a marked vasoconstrictor reaction of the anterior tibial artery. Upon further administrations of eupaverin the signs of the ischemia soon disappeared; six months later recovery had occurred except for insignificant symptoms in walking, and when at rest the patient no longer felt any symptoms. The pulse also had returned in the anterior tibial artery while that of the posterior tibial artery was absent. There were no cardiac symptoms.

Case 3. A woman, aged fifty years, had suffered with cardiac symptoms for many years. In November, 1938, she had an amputation of the left thigh because of gangrene. At the end of December she was admitted to the Internal Medical Clinic for mitral stenosis and insufficiency with complete arrhythmia. There, on October 1, 1939, the patient suddenly experienced severe pains in the right lower extremity with a feeling of burning and formication in the foot and lower leg. The extremity was cool and pale, with small livid spots. The motions in the leg were limited and painful. The pulse was present in the femoral artery, but not in the popliteal. The femoral vein showed no signs of a thrombosis. In the arteriogram the artery showed smooth contours and was well filled up to the joint cleft. In certain areas there were slight arch-shaped indentations of the arterial wall (spasms), and the ending had the form of a cephalad convex arch. There was no filling of the popliteal artery. The collateral circulation was good, especially in the region of the knee, so that only the anterior tibial artery showed a filling. The filling ended in the middle of the lower leg. There was no arterial filling in the lower portion of the lower leg nor in the foot. The diagnosis was embolus of the popliteal artery with an abundantly developed collateral circulation, which the filling of the anterior tibial artery provided. A resection of the thrombosed section was advised, together with lumbar sympathectomy, but the operation was refused and, therefore, infiltration of the lumbar sympathetic nerve according to the method of Leriche was done. The condition improved slowly, and the leg was retained.

The author prefers thorotrast to iodine preparations as it is an excellent contrast medium and does not irritate the vascular endothelia; therefore it does not increase an already existing vasoconstriction. As a rule, the injection should not be given percutaneously. The author commends the accurate topographic-anatomical localization of the embolus in the arteriogram, as it gives accurate information as to whether a vessel is not the site of several emboli, it shows the actual condition of the collateral circulation, and makes possible the differential diagnosis between a classical embolus and vascular spasm, indicating clearly whether it is produced by a micro-embolus or a massive venous thrombosis.

(Bode). Louis Neuwelt, M.D.

Strömbeck, J. P.: The Effects of Arterial Resection; Experimental Arteriographic Study (Effets de la résection artérielle. Étude angiographique expérimentale). *Acta chirurg. Scand.*, 1940, 83: 510.

Stroembeck reports animal experiments carried out to check on the results obtained by Fontaine and Schattner, Leriche's associates, in regard to the effect of arterial resection in cases of arterial obstruction. Fontaine and Schattner, in their experiments, produced thrombosis of a segment of the femoral artery by placing two ligatures on the artery 4 or 5 cm. apart, bruising the arterial segment between these ligatures, and injecting a few drops of salicylic acid or coagulen; a corresponding segment of the opposite side was resected. Arteriography showed a much better established collateral circulation on the resected side.

Strömbeck's technique was different, and he claims that it shows more correctly the clinical conditions under which arteriectomy is done. His experimental animals were rabbits; in 6 animals vigantol was given through the stomach tube for twenty days prior to the operation on the arteries, with a view to hastening the development of an arteriosclerotic lesion. In each animal obliteration of a segment of the superficial femoral artery was produced on both sides by two ligatures, and histological examination of such segments showed that the lumen of the artery was obliterated by this procedure without the injection of a sclerosing solution. From seventeen to nineteen days later, the arterial segment between the two ligatures was resected on one side, new ligatures being placed above and below the former ligatures. From two to one hundred and thirty-seven days later an arteriographic study was made on both sides by the injection of 10 c.cm. of thorotrast into the left carotid artery, and making a radiogram toward the end of the injection; with this technique the arteries of the hind legs were well shown. Two minutes later a similar injection was given and another radiogram made; the veins were slightly filled at that time. In 4 of the 7 animals there was no difference in the collateral circulation on the two sides; in 2 animals the collaterals on the resected side were somewhat larger and better filled with the opaque medium; in 1 animal the collateral circulation was better established on the non-resected side. It is noted that this latter animal was the only one showing marked arteriosclerotic changes following the administration of vigantol. In 4 of these animals thorotrast was also injected into the arterial trunk just below the arterial segment ligatured; in 3 of these this trunk filled better with the opaque medium on the non-resected side; in 1 on the resected side. In 1 animal, the technique of Fontaine and Schattner was used, except that no sclerosing solution was injected into the ligatured segment; in this animal arteriography showed a much better filling of the collaterals on the resected

side twenty-seven days after operation. With his own technique, however, Strömbeck finds that resection of an obliterated arterial segment has no definite effect on the collateral circulation.

ALICE M. MEYERS.

BLOOD; TRANSFUSION

Fine, C. S., Alter, R. L., and Baptisti, A., Jr.: Studies on Preservation and Use for Transfusion of Placental Blood. *Am. J. Obst. & Gynec.*, 1940, 39: 462.

Hematological studies of placental blood revealed that such blood would be desirable for adult transfusion if it could be collected sterilely, in sufficient quantities, and satisfactorily preserved. An attempt was made to confirm the work of previous investigators who claimed placental blood could be adequately collected and preserved and subsequently given in transfusions to adults with a minimal number of reactions. By using the usual bacteriological culture media, placental blood could apparently be collected and preserved sterilely, but the subsequent transfusion of these specimens was accompanied by a high percentage of reactions.

A comparative study of several different preservative solutions indicated that 1.5 per cent sodium citrate in normal saline solution is the most desirable solution. Further bacteriological studies, using special culture media, revealed that a high percentage of the collected blood was contaminated. Several modifications of the method of collection did not eliminate such contamination. However, the transfusion reactions could not be correlated with bacterial contamination or any other detectable factors, such as the amount of hemolysis, type of preservative, and the time of storage.

The authors' studies indicate that the biological significance of placental blood is somewhat greater than that of adult blood. Theoretically, the use of placental blood for transfusion is attractive; however, the technical difficulties encountered in its collection and sterile preservation are sufficient to make its use impracticable.

EDWARD L. CORNELL, M.D

Gironés, L.: Results of Blood Transfusion during the Spanish War (Ergebnisse der Bluttransfusion waehrend des spanischen Krieges). *Med. Klin.*, 1939, 2: 1420.

The results of transfusion are varied judging from the discontinuance of this method of treatment. Transfusions should be done only in very serious conditions. There is a limit beyond which transfusion is useless. When the patient has marked motor-nerve disturbance and does not react to external irritation, when the pallor is of a livid cyanotic hue, when the conjunctival reflexes are abolished and the pupils are dilated, transfusion is contraindicated. On the other hand, at times a remarkable result may be obtained. As an example, the following clinical record is given:

The patient sustained a gunshot injury of the abdomen. All usual methods of treatment were applied without any definite result. The pulse and respiration were hardly recognizable. Despite such ominous conditions, a laparotomy was done three hours after the injury and a massive hemorrhage was discovered. Three perforations in the ileum and 1 in the colon were sutured. During the operation the patient was practically pulseless. Then an 800 c.cm. blood transfusion was given. Even while the transfusion was being given improvement was noted, the pulse and respiration were better. The patient recovered.

Only a few patients had chills after the transfusions. Frequently a chilly feeling occurs from four to six hours after the transfusion. The temperature rose to 38 degrees. Chills and temperature elevation were suffered by the donors after a few hours. These were ascribed to the injections of physiological salt solutions into the donors' veins. No different effect was noticed after the injection of pure sodium chloride (Merck) in distilled water, or tap water with the ordinary pulverized table salt sterilized by boiling. This information is important during war. According to the clinical course, the author divides the transfused patients suffering war injuries into 5 groups: (1) wounded soldiers in a desolate condition; the majority of them die during the transfusion; (2) wounded soldiers who do not react favorably during nor after the transfusion, and nearly all of whom die; (3) patients who react favorably, but die within twenty-four hours; (4) wounded patients who react well and remain alive; and (5) wounded patients who react well but die later from other causes. For the summary only the groups 2 to 4 are considered.

There were 4 stands ready from which 240 transfusions were given.

	Blood banks ready for transfusion			
	A	B	C	D
Positive results, in per cent	80	66	58	53
Gun-shot wound cases, in per cent	62	40	36	64
Average amount transfused.	620 c.cm.	538 c.cm.	590 c.cm.	415 c.cm.

After twenty-four hours there were 53 patients, i. e., 80 per cent, still living. The greater the amount of blood given, the more favorable the results. Direct transfusion from donor to recipient is predominantly the most effective.

(FRANZ). MATHIAS J. SEIFERT, M.D.

Gourévitch, G., and Kogan, D.: Reactions Following Blood Transfusions (Material zur Klaerung der Reaktion nach Bluttransfusionen). *Chirurgija*, 1939, 7: 3.

The article is concerned with reactions following transfusions which were carried out in the regular manner and omits all complications resulting from technical errors. The authors base their conclusions

on 701 blood transfusions performed for the most varied indications. The reactions are classified as severe, those with temperatures over 39° C.; moderate, with temperatures between 38° and 39°; and light, with temperatures between 37° and 38°.

Examples are taken from the large series of cases: in 240 transfusions in which both donor and recipient belonged to Group O, reactions occurred in 43.3 per cent; in 216 Group "A" transfusions, 36.6 per cent; in 75 Group "B" transfusions, 40 per cent; in 51 Group "AB" transfusions, 29.4 per cent; and in 119 transfusions with blood from universal donors, reactions occurred in 47.9 per cent. Thus, the transfusions of blood from universal donors gave the greatest number of reactions, while the universal recipient group was the most favorable. Another table demonstrates that children up to one year of age showed no reactions following transfusions, while after the first year of life, age and sex exerted no influence on post-transfusion reactions.

The difference between transfusions with fresh, citrated blood and those with preserved blood is discussed. Three hundred and ninety transfusions were performed with fresh, citrated blood with reactions in 34.8 per cent, and 311 were performed with preserved blood with reactions in 48.1 per cent. In general, it can be said that although individual groups show certain differences, reactions following the transfusion of preserved blood occur more frequently, but are distinctly less severe than those occurring after the transfusion of fresh, citrated blood. Furthermore, the authors favor indiscriminate transfusion of the blood of universal donors, and characterize as invalid the objections expressed by others.

The authors then deal with the causes of post-transfusional reactions and share the viewpoint of Bogolometz in general. Experiments are reported with autotransfusions which were carried out under the same conditions as the usual transfusions. Reactions in 21 were of the same frequency (13) and severity as in other transfusions. The effect of citrate was tested, 16 patients receiving injections of 30 c. cm. of a 6 per cent citrate solution. The reaction consists of reddening of the face and disorientation of from eight to ten seconds' duration. This citrate reaction pursues a similar course in all experiments and is regarded as entirely harmless. Thirty autotransfusions were conducted under particularly aseptic precautions and after special cleansing of the apparatus (washing and boiling with soap and lysol solution, 0.1 per cent caustic soda in distilled water, and sterilization in autoclaves). In these transfusions there were only 5 reactions, 2 of which could be attributed to technical errors.

The authors conclude that the cause of post-transfusional reactions lies chiefly in the imperfection of materials, in addition to the frequent occurrence of an acid reaction of the distilled water used for the preparation of the citrate solution. They recommend the direct transference of blood by means of apparatus which has been cleansed according to the method described.

(Hesse). O. Theodore Roberg, Jr., M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Beckerman, L. S.: An Analysis of Determinations of the Chloride Content of the Blood in Patients During the Pre-Operative and Postoperative Periods. *Vestnik khir.*, 1939, 58: 309.

Determinations of the chloride content of the blood in 115 patients showed great variations of the sodium chloride, ranging from 425 to 590 mgm. per cent. As a rule the amount of chloride in the blood of women slightly exceeds that of men. Hypochlorinemia is a nearly constant symptom of gastrointestinal obstruction but is not pathognomonic for this condition as it may be encountered in other diseases accompanied by dyspeptic symptoms, such as profuse vomiting or diarrhea, as well as in pneumonia, peritonitis, and a number of acute inflammatory processes. Hypochlorinemia is a nearly constant symptom of a mechanical as well as dynamic type of intestinal obstruction. The degree of diminution of the chloride content of the blood ranges as a rule from 10 to 30 mgm. per cent. This phenomenon probably has no relation to the type of condition, or to the character or duration of the operative procedure. A fall of chloride in the blood exceeding 30 mgm. per cent indicates an impending complication such as pneumonia or intestinal atony. The intensity of the fall in chloride content parallels the gravity of the toxic symptoms.

A diminution of the chlorides in the blood during the postoperative period exceeding 150 mgm. per cent, in comparison with the normal chloride level before the operation, as well as a total chloride content below 300 mgm. per cent, indicates a very grave condition, threatening the life of the patient.

In order to prevent postoperative complications in patients with hypochlorinemia, pre-operative repeated infusions of hypertonic sodium-chloride solutions and also blood transfusions are indicated.

JOSEPH K. NARAT, M.D.

Veal, J. R.: High Ligation of the Femoral Vein in Amputations of the Lower Extremities. *J. Am. M. Ass.*, 1940, 114: 1616.

Pulmonary complications following amputation for vascular gangrene of the lower extremity are common and conspicuous. In two rather large series of cases previously reported, approximately half of the patients who died showed evidence of pulmonary complications. Although the diagnosis of these cases was usually pneumonia, the author believes that the pneumonitis was embolic in origin in many instances. Evidence obtained from dissection of the stump at post mortem showed thrombosis or thrombophlebitis of the femoral vein proximal to the ligature, and hence presumably this was the source of the emboli.

Dissection of the femoral vein in cadavers revealed many variations in its tributaries. The principle tributaries are the great saphenous and the deep profunda veins; the remainder of the branches enter the femoral vein, in many instances, in an inconstant and haphazard fashion. In certain individuals the muscular tributaries enter the femoral vein in a fairly regular manner so that the vein is assured of a fairly good blood flow at all levels. In other individuals the muscular tributaries are sparse and leave long portions of the vein devoid of branches. It is in the latter group that long thrombi are likely to form and subsequently lead to embolic phenomena following ligation at amputation.

In order to overcome the danger of embolism from thrombus formation in the femoral stump, the author performs a preliminary high ligation of the femoral vein in all amputations of the lower extremities. Twenty-eight consecutive amputations have been preceded by this procedure, and in none of them has a pulmonary complication developed. The author believes that the mortality rate has been materially reduced by this simple procedure. The technique of ligation is as follows:

The great saphenous vein is exposed in the femoral triangle through a short vertical incision and is followed down to its junction with the femoral vein. The latter vein is exposed and ligated with braided silk just distal to the saphenofemoral junction. The deep tissues are closed with plain catgut and the skin with silk. Amputation is then carried out at the desired level.

The author has found that ligation just distal to the saphenofemoral junction is the most desirable level since no edema of the stump develops following this procedure. Furthermore, the flow from the saphenous vein insures a steady stream of moving blood which tends to prevent the formation of a thrombus.

LUTHER H. WOLFF, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Gasné, A.: The Use of Total Circular Plaster Casts in the Treatment of the Wounded in War (A propos de l'emploi des appareils plâtrés totalement circulaires dans le traitement des blessures de guerre). *Mém. l'Acad. de chir.*, Par., 1940, 66: 146.

Gasné had opportunity to observe many Loyalist Spanish soldiers who sought refuge in France after the defeat of their government. In many of the wounded men, a complete circular plaster cast had been employed, encircling the thorax, arm, and forearm in wounds of the upper extremity, and the pelvis, thigh, and leg in wounds of the lower extremity. These casts had been applied to the wound without dressing and without fenestration.

In some of these cases the general condition of the patient was bad and there was definite evidence of infection. In the group recently treated there were 5 cases of tetanus, 3 cases of gangrene, and 2 cases of gas gangrene. In the cases in which the plaster cast had been in place several months, the wound was badly infected and the plaster saturated with pus; on removal of the cast, it was found that the wounds showed no signs of healing, but in most cases in which only the soft tissues were involved thorough cleansing of the wound or irrigation with Dakin's solution resulted in healing. Only exceptionally was there any consolidation of fractures, and even in these cases there were definite areas of osteitis. In some cases of fracture amputation was necessary; in others conservative treatment with thorough cleansing of the wound and later immobilization in suitable apparatus or a light plaster cast resulted in ultimate recovery.

Even in those cases in which the general condition of the patient was good, and there was no serious infection, fractures usually had not healed. However, in a few cases in which the plaster casts had been worn for months, the fractures were healed and in good or fairly good position; the soft tissues were markedly atrophic, but the joints sometimes showed good function; in other cases, joints were fixed in the position imposed by the plaster cast.

The results of this method of treating war wounds with circular plaster casts without previous treatment or dressing of the wound appear so unfavorable that the author considers that its use is contraindicated, at least until after it has been modified and studied by skilled surgeons. ALICE M. MEYERS.

Montanari Reggiani, M.: The Infiltration of Novocaine in the Treatment of Acute, Circumscribed Inflammatory Processes (Sulle infiltrazioni di novocaina nel trattamento dei processi infiammatori acuti circoscritti). *Arch. ital. di chir.*, 1940, 58: 1.

Reggiani cites opinions for and against the use of novocaine in acute circumscribed infections, and reports a series of cases treated by himself. The patients were divided into three groups: 5 for whom local anesthesia was not employed, 15 for whom 1 per cent novocaine was infiltrated in quantities varying from 2 to 4 c.cm. to 20 to 40 c.cm., and 6 for whom novocaine was used at a pH of 5.21 or of 7. In all the cases of the first and second groups, leucocyte counts and differential counts were made at intervals on the circulating blood, and on blood obtained from the periphery of the inflammatory zone. In the evaluation of the differential counts, the criteria advanced by Schilling were employed. The anesthetic was injected directly into the inflamed area, even after localization had taken place. The types of lesion treated varied greatly and included simple abscesses of the extremities, breast, lymph glands, and perianal tissues. The organisms were chiefly of the common pathogenic bacteria.

The results obtained in the first group were in accord with those obtained by other observers, the peripheral white count varying with the intensity of the process and the force of the response, and the perifocal count showing either a physiological level or a frank leucopenia. In the differential count the usual diminution of lymphocytes, monocytes, and eosinophils occurred, with a shift to the left, these modifications being far more marked in the peripheral than in the perifocal blood.

The second group comprised 7 cases in which infiltration was practiced before suppuration and localization took place. In these cases it was observed that the signs and symptoms of inflammation diminished promptly and that complete resolution occurred in a period varying from three to five days. The remaining 8 cases, in which localization had taken place, showed satisfactory but less striking results. In this group, as in the preceding one, the perifocal blood showed fewer inflammatory modifications than the peripheral blood; in fact the general leucocytosis was in all cases less than in Group I, while the perifocal leucopenia was less marked. With reference to qualitative changes in the inflammatory area, the lymphocytes offered the most significant clue. After the first or second injection an increase in these was almost constantly observed, a modification closely paralleled by the monocytes, and interpreted by the author as the final phase in the reaction to inflammation and, hence, as an index of prompt healing.

In the third group attention was directed to possible modifications of the tissue pH by the infiltration of acid or neutral novocaine, with resultant effect upon the virulence of the invading organisms. It was observed that both of these solutions tended to convert an exudate, in all cases acid, to a pH above 7. Since the curve of acidity closely follows the clinical course, it is believed that the modification of that factor by novocaine might be the mechanism by which improvement with that method was obtained. More specifically, it has been demonstrated that the pain of such lesions is a direct function of the acidity, and that the anesthetic value of the novocaine is due to that factor.

EDITH FARNSWORTH, M.D.

Hagenmueller, A.: Local Tetanus in Human Beings (Ueber den lokalen Tetanus beim Menschen) Erlangen: Dissertation, 1939.

The difference between local and general tetanus was recognized as early as 1363 by Guy de Chauliac, as well as by Larrey, the great army surgeon of Napoleon. During recent times, cases were reported by various authors, but they are not numerous. Experiments with white mice demonstrate typical results. Injecting a lethal dose of tetanus subcutaneously on one side of the mouse, from the shoulder to the hip with a long needle, results in an immediate unilateral tonic spasm on the side injected. After the poison diffuses from the spinal marrow on the side injected to the opposite side, the tetanic rigidity becomes bilateral, then proceeds to generalized tetanic cramps, and ends in death as a result of diaphragma-

tic cramps. If no lethal dose is injected, a unilateral spasm results which gradually subsides. If, however, the dose is greatly increased beyond its lethal limits, the effect is so rapid that no mere unilateral spasm is noticed. A local tetanus is produced if a large peripheral nerve is injected with tetanus poison. In human beings and larger animals the typus ascendens, i.e., a local tetanus progressing to constantly increasing general symptoms, is seldom observed. In regard to the dissemination of the poison, there are two different theories: (1) one group claims that the tetanus poison follows the axis cylinder of the peripheral motor nerves to the central nervous system; and (2) the other group, namely, the American, believes that the poison is carried by the blood and lymph-vessels without any participation of the motor nerves. The latter group observed no local tetanus after injecting the peripheral nerves. The theory of the first group is predominantly accepted to date. The explanation, that in human beings the general type of tetanus is commonly found, is supported by the fact that the blood stream carries the poison to the central nervous system faster and by shorter nerve routes, while the path of the poison from the peripheral motor nerves near the site of entrance of the poison is much the longer one, so that local tetanus with the later ascending symptoms can no longer be observed. Local tetanus occurs only after a minimal infection, usually after an early serum-prophylaxis. If a serum prophylaxis has not been given, the incubation period increases a remarkably long time. This long incubation period is supposedly caused by the distance from the spinal marrow—a theory that appears tenable. Kawincochlic observed the period from infection to definite symptoms as follows: for injuries of the fingers and toes, 13.53 days; leg, 12.73; thigh, 11.85; face, 11.69; hand, 12.26; forearm, 13.04; arm, 10.69, and head 8.78 days. Ponomarer experimented with dogs and found that the incubation period depends upon the subarachnoidal and muscle-tissue pressures, in as much as these pressures influence the centripetal lymph current in the nerves to act as a carrier of the toxins. The increased pressure in the subarachnoidal space prolongs the period of incubation, while increased pressure in the muscle tissue (e.g., while at work) shortens the incubation period. It is certain that the longer the incubation period, the more favorable the prognosis. Local tetanus at the beginning of infection in human beings is not very infrequent. This is proved by the reports of Arnd and Walthard who found 105 such cases among 506 tetanus sufferers; also by Kreuter's report of 14 such cases among 31 tetanus patients. Unfortunately there is too little observation by the rank and file of physicians; hence, cases are not reported. Gussmann found a protracted purely local tetanus in 10 per cent of 396 cases. That this was found more frequently during and after the World War is most probably the result of the serum prophylaxis (Taylor and others).

The author reports 3 of his own cases from the Nuerenberger Hospital, which are quite unique.

Case 1. As a consequence of jumping into a dugout, both the patient's thighs were fractured and one side sustained a badly lacerated wound about the size of a dollar. Tetanus prophylaxis with 2,500 units of serum and 20 c.cm. of gas edema serum were given. Despite primary dressing and suturing, the healing of the wound was greatly complicated by suppuration. On the fifty-fourth day a tetanus of the head, but absolutely no involvement of the body nor of the joints occurred; death followed in eleven days. It was remarkable that avertin sometimes but not always controlled the tetanic contractions of the muscles of mastication; and, when effective, it was only for a short time and even then not complete. Microscopic sections showed multiple bronchopneumonic foci, which was remarkable, as the patient suffered no diaphragmatic cramps. The author is of the opinion that in this case the tetanus poison may have been carried to the head by the blood stream; since the site of infection in the thigh was so far distant from the head, any other explanation is hardly tenable. (Yet, the patient had a few minor skin abrasions of the head and face). Possibly the patient could have overcome the tetanus of the head if the virulent suppuration caused by staphylococci and Fraenkel-gas-bacilli) had not reduced his resistance. In addition, the patient developed an oculomotor paralysis. However, bilateral or unilateral cerebral paralysis, especially of the facialis and abducens nerves, often were observed in tetanus of the head.

Case 2. The patient fell from a truck and sustained a fracture of the right humerus with a flesh wound of the arm and a central dislocation of the femur with injury of the right acetabulum. Tetanus serum (2,500 A.E.) and gas-edema serum (20 c.cm.) were given. Immediate operative dressing and suturing of the wound were done; the stitches had to be rewound later because of suppuration. Fourteen days later a severe and painful local tetanus appeared in the arm which compelled an amputation. Notwithstanding the serum treatment, the patient died after four days. In this case also the author did not ascribe death to the local tetanus alone, as there was a prolific suppuration with gas-bacillus infection.

Case 3. The patient fell from a bicycle and sustained a partial desquamation of the skin, with a deep muscle wound on the extensor surface of the arm, and a fracture of the medial epicondyle of the humerus. Two hours after the accident operative treatment of the wound and an injection of an albumin-minus tetanus serum (2,500 A.E.) were given. After ten days a local tetanus of the right forearm began. Serum treatment resulted in a cure, but the neurological findings were neuritis with total degenerative reaction in the region of the radial nerve, and partial degenerative changes of the triceps and trachioradial muscle areas. Both these conditions may have been the result of trauma. However, the consequences of the serum prophylaxis must be considered, although a tetanus serum was not given immediately following the injury, and

also, because an albumin-minus serum was administered. (Franz). Mathias J. Seifert, M.D.

Jaeger, F.: Tetanus Prophylaxis or Not? (Tetanusprophylaxe oder nicht?) *Muenchen. med. Wchnschr.*, 1939, 1: 164.

This question of using tetanus prophylaxis or not is so urgent that it was selected as a subject for the next International Congress on traumatic surgery. By inquiries to general practitioners it had been learned that a large percentage of them do not give prophylactic anti-tetanus injections and do not believe in their effectiveness. It is interesting that Hinstorff in 1927 received positive answers as to the regular use of tetanus prophylaxis in 98 per cent of the cases of soiled wounds. He also stated that the mortality was 76 per cent in the preprophylactic era, while later it amounted to only 51 per cent. Mosbacher figured a mortality of 28 per cent in tetanus cases that had received injection treatment within the first twelve hours after injury, while it was 37 per cent in those injected later. Franz said in his *Military Surgery* that with the introduction of general prophylaxis, the tetanus in the armies of the World War almost disappeared. This means for the German army that about 10,000 injured men were saved from tetanus.

The anti-tetanus prophylaxis was favored in the replies to a questionnaire sent in 1933 to the heads of the German surgical university clinics. Jaeger quotes some of the answers. The reappearance of doubts is due to the fact that the wound excision according to Friedrich has increasingly come into general usage, and its users believe to be able to renounce anti-tetanus prophylaxis. The author proves conclusively that this conception is erroneous. Many surgeons do not differentiate clearly between wound excision (Friedrich) and surgical wound toilet (von Bergmann). Heller, one of Friedrich's pupils, recently stressed this difference. Wound excision means excision of the whole wound. If it is carried out within the first six hours, one may assume that the wound and the germs which at this time are still superficial and have not penetrated into the depth have been removed, the tetanus germs included. Serum prophylaxis then is superfluous. However, unfortunately, only comparatively few and superficial wounds can be excised *in toto*. If a wound is excised after six hours, or only cleaned surgically, bacteria have already penetrated into the depths, and the wound is no longer free of bacteria. It is just the faulty intermingling of these two measures which produces the so frequent serious complications after primary wound suturing. A wound which was cleaned only surgically, must, as also Friedrich demanded, remain open; if excision after the time limit established by experience has been done, and the wound has been sutured, it should be drained. Furthermore, one must keep in mind that there are wound infections in which the discussed time limits cannot be applied, such as laboratory injuries with bacterial cultures, injuries in the operating room, fishbone injuries, and bites. In these cases also early total wound excision avails nothing and one must never attempt primary closure. Thus, the Munich Clinic does not give prophylactic anti-tetanus injections when they can totally excise and thus sterilize a common accidental wound quite early. In all other cases, they give the prophylaxis as early as possible, possibly within the first six hours, and after this time has elapsed, they give 2 or 3 times the usual dose,and furthermore, as the protection lasts only twelve days, they repeat the injection in cases of prolonged wound healing.

The author objects strongly to consulting the general practitioner on this question. The clinics do not treat only hospitalized patients, but their out-patient departments take care of an enormous number of injuries, the like of which the general practitioner never gets a chance to see. The Munich Poliklinik (out-patient department of the surgical university clinic) in the last ten years has treated 40,000 fresh injuries and none of the patients who there had received proper anti-tetanus prophylaxis developed tetanus. On the other hand, during the same time 10 patients with tetanus were hospitalized; they had not had proper anti-tetanus prophylaxis. The Munich Clinic has seen only 1 case of neuritis of the plexus brachialis as a complication of the prophylaxis; the condition healed within three months.

Ehalt proclaims from Boehler's Clinic that they rely so strongly on their prophylactic wound excision that they will renounce prophylactic tetanus antitoxin injections. The author believes this policy to be risky. Besides, this clinic still used the prophylaxis in 155 (12.8 per cent) of 1,210 cases of wound excision, and in 315 (14.1 per cent) of 2,229 cases of severed skin. Furthermore, it is certain that in 7 cases treated there primarily tetanus did develop; 6 of these had not had prophylaxis. Boehler himself says that as not every wound can be excised, serum prophylaxis has to be used in cases of soiled wounds in territories where tetanus occurs. As to the physician's liability, the author stresses that the doctor cannot be blamed if the primary wound treatment has been carried out according to the established rules. The author expressly refers to a paper of Franz in *Der Chirurg* which concurs with his opinion. (Franz). Heinrich Lamm, M.D.

Lawrence, K. B.: Sulfanilamide Therapy in Chronic Undermining Streptococcal Ulcer. *New England J. Med.*, 1940, 222: 573.

The author describes the case of a fifteen-year-old school girl who had sustained a floor burn in the school gymnasium, the affected area being just below the knee on the anterolateral aspect of the leg. An ulcer formed which stubbornly resisted various forms of treatment for two months. Dakin's solution, simple saline dressings, and dilute acetic acid all seemed effective in cleaning up the lesion at times, even promoting a degree of healing. Exacerbation of the ulcer activity then invariably

occurred. Zinc peroxide at first appeared even more effective. When, however, an attempt was made to pinch-graft the clean ulcer base, the grafts promptly sloughed and the ulcer again became active. Zinc-peroxide paste was ineffective when tried on three subsequent occasions. This failure may well have been due to the inferior oxygen-liberating power of the material available. The complicating organism, bacillus pyocyaneus, present in the ulcer at this time may also have had some influence. X-ray therapy was entirely ineffective.

After the initial treatment period of two months, the ulcer was only a little smaller than on admission. There was less undermining, but the granulations of the base were still heavily infected. Sulfanilamide treatment begun at that time gained control of the inflammatory process within four days. Epithelization, however, was slow, perhaps because of the fact that sulfanilamide may exert some inhibitory effect on wound healing. The periods of rest from the sulfanilamide, necessitated by significant drops in the red-cell count, also added to the total healing time. Resumption of the drug on each occasion demonstrated convincingly its prompt effect on the inflammatory process.

It is rarely necessary to administer sulfanilamide in such high total dosage (8,400 gr.) for so prolonged a period (four months). When one recalls the toxic side-effects of this drug, this case is of some importance in indicating the quantities which can be administered safely to a non-susceptible individual. Moderate reduction in the red-cell count and a slightly diminished renal function during the treatment period were the only significant toxic effects. Three months later a check-up of the peripheral blood picture and the renal and hepatic functions by standard methods showed normal findings.

Despite daily dosages of 100 gr. of sulfanilamide for long periods, it was never possible to raise the blood serum level above 3.4 mgm. per 100 c.cm. The low serum sulfanilamide level may have accounted in part for the absence of serious additional effects.

Approximately 60 gr. of sulfanilamide daily was required to maintain the ulcer in a healing phase, with a dosage of from 80 to 100 gr. (2 or 3 mgm. per 100 c.cm. serum level) as a safe margin. Daily dosage of 120 gr. for a short period in this case resulted in no additional improvement in the healing and gave the patient anorexia and mild cyanosis. There was no febrile reaction on resumption of the sulfanilamide in full doses after a rest period, or at any other time. The patient experienced no reaction after any of the four transfusions, nor was there any ill effect from simultaneous administration of ferrous sulfate and the sulfanilamide, over fairly long periods.

No micro-aerophil hemolytic streptococci were recovered from the ulcer. The strain was beta hemolytic and seemed to grow well in air. In 1 culture a poor growth of streptococcus viridans was identified after periods of both zinc-peroxide and sulfanilamide treatment. Clinically, however, the ulcer resembled the type described so adequately by Meleney, from which he was able to isolate micro-aerophile organisms. The admittedly good control of the ulcer activity obtained by the first and potent lot of zinc peroxide seems to justify further the classification of this ulcer with Meleney's group.

A combination of zinc-peroxide dressings—when a more constantly potent product can be developed—and sulfanilamide, administered systemically, may well prove the ideal treatment for this serious disease.

SAMUEL H. KLEIN, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Rodrigues, A., and Carvalho, R.: Roentgen Kymography in the Study of the Respiration (La roentgenkymographie dans l'étude de la cinématique respiratoire). *Arch. méd.-chir. de l'appar. respir.*, 1939, 14: 24.

Kymographic studies are reported of the movements of the diaphragm and of the thoracic cage following section, and after alcoholic injection of the phrenic nerves, laterally and bilaterally; and following alcoholic injection of the intercostal nerves. Movements in artificial pneumothorax are also recorded.

According to the authors the superior lobes of the lungs are immobilized by injection of the intercostal nerves, whereas there is a compensatory increase in mobility of the inferior lobes. Just the reverse of this condition follows section or injection of the phrenic nerve.

These observations suggest that roentgen kymography may have a valuable application in collapse therapy of the lungs, not only in planning the details of treatment, but also in checking its effectiveness.

SYDNEY E. JOHNSON, M.D.

Guardabassi, L.: The Contribution of Pyelography to the Diagnosis of Extrarenal Abdominal Tumors (Contributo della indagine pielografica alla diagnosi di tumori addominali extrarenali). *Radiol. med.*, 1940, 27: 224.

Guardabassi states that roentgen examination of the empty abdomen may in some cases give interesting information concerning the location and form of the kidney, but examination must always be completed by pyelography. The descending or the retrograde method, or both, should be used, the choice depending on the case. However, retrograde pyelography presents the advantage of giving the clearest pictures and is absolutely indicated in the presence of pararenal tumor because the other method frequently gives no picture of the pelvis and ureter in cases of this type. The author describes the topographic, morphological, and functional changes of the kidneys and ureters caused by extrarenal abdominal tumors, reported in the literature, and reviews briefly 27 personal cases in which he has used pyelography.

His observations confirm the fact that descending pyelography usually does not give any picture of the urinary passages on the side on which the abdominal tumor extends most: retrograde pelography only can then give the required information on the anatomical condition of the involved organ. However, the two methods must be considered as complementing one another. Two of his cases showed that the renal changes are reversible by roentgen therapy. There are no changes in the location and form of the urinary passages which are more or less characteristic for one or another tumor; aneurysm of the aorta may cause the same displacements as a tumor of the lumbo-aortic lymph nodes or an extrarenal hypernephroma. Among the author's cases, there were 15 retroperitoneal tumors. There was more or less marked displacement of the kidney and ureter in 8 cases, while morphological or functional changes were noted in 6, and it is logical to think that displacements would have been found in some of the latter cases if retrograde pyelography had been used. Consequently, retroperitoneal tumors nearly always cause changes in the location or at least in the form of the urinary passages. On the other hand, Foerstel has claimed that there is always a pyelo-ureteral congenital dystopia in endoperitoneal tumors which are accompanied by renal displacement. This is not always true because the roentgen criterium to determine whether a pyelo-ureteral ectopia is congenital or not rests on the demonstrable length or shortness of the ureter. This criterium may lead to false interpretations when the following two basic factors are not taken into account: (1) descending pyelography gives no result in renal compression; and (2) unless special precautions are used, retrograde pyelography does not show the exact length of the ureter, but only the length of the opaque catheter which straightens small curves and reaches the pelvis by the shortest route. The author's cases show that the renal pelvis and ureter are only rarely displaced by endoperitoneal tumors; on the other hand, these cases often present a change in the renal function revealed especially by more or less marked pyelo-ectasia.

RICHARD KEMEL, M.D.

Parola, G.: Dystrophic Abdominal Calcifications Not Located in the Cavities of the Abdomen (Calcificazioni endoaddominali distrofiche non endocavitarie). *Radiol. med.*, 1940, 27: 197.

Parola discusses only the dystrophic calcifications of the abdomen encountered in the parenchyma of an organ or in pathological tissues.

Peritoneal calcifications present such variations in localization and form that they cannot be classified; besides, they may simulate calculi belonging to various organs. They may represent remnants of tuberculous peritonitis (the opacity of the granules is greater at their center); irregular, multiple, and mobile epiploic incrustations; meconium concretions; round eggs of parasites; particles of echinococci, calcified echinococcus cysts of regular round contour and varying size; real peritoneal calculi with opaque nuclei separated by more transparent and irregular spaces; and mesenteric cysts which are recognized by their spherical form and stratification.

Calcified lymph nodes are most frequently mesenteric or retroperitoneal; isolated; small, round, or irregular; and present an opacity similar to that of

bone. They may be mesocolic, gastric, hepatic, or splenopancreatic. Lateral exposure is recommended for their recognition and they must be differentiated from renal calculi and calculi of the urinary passages.

Phleboliths occur in almost one-third of the adults; they are from 2 to 5 mm. thick and increase in length with the age of the patient; their density is that of bone cortex, their contour is well defined, and they are placed in a row. They are found in the pelvis usually at the level of the ischiatic spine or along the upper border of the pubis; they are symmetrical and bilateral, roundish or oval, and have a more opaque center. They may be found along the ureters and must be differentiated from ureteral calculi which are located more craniad than the phleboliths.

Calcification of the arteries is easily recognized by its cylindrical shadow with double contour, slightly waving course, and more opaque patches due to large calcified plaques. According to the degree of calcification, the artery may appear as a cord with linear margins or as a homogenous streak; it may present granulations or rings. Arteriography is useful to study calcification and avoid confusion. Calcification of aneurysms of the aorta is more or less regularly annular and found in concentric layers; that of the renal arteries is rare.

The calcifications of the digestive tract include enteroliths which are found especially in the colon and the appendix and at times in diverticula of the intestinal wall: they are round, cylindrical, or oval and are formed around a nucleus of varying extraneous material. The opaque meal is useful for their recognition. Tuberculous processes and tumors of the intestine and also the wall of the stomach may be calcified.

Calcification of the hepatic parenchyma is rare: calculus of the intrahepatic biliary tract must be excluded by its lack of homogenous appearance, but the differential diagnosis is difficult and is usually made at necropsy. Phleboliths and calcified echinococcus cysts, larvæ of pentastoma denticulatum (picture similar to that of phleboliths) or wall of the gall bladder may be encountered. Calcifications in the spleen are still rarer: anterior, posterior, and lateral exposures are needed with verification of the mobility of the shadow with that of the spleen; stereography, pneumoperitoneum, and splenography are useful. When the calcification is located in the hypochondrium, that of the costal cartilages must be excluded.

Calcifications found in the pancreas are usually calculi; they are located on an oblique line from left to right and from above downward between the twelfth dorsal vertebra and the second lumbar vertebra.

Renal calcification may be due to nephrolithiasis, tuberculosis, abscess, tumors, mercury-bichloride poisoning, cysts, pseudocysts, and parasites. The possibility of retention of opaque substance must be considered and perirenal calcifications must be differentiated. Roentgen examination should be completed with pyelography.

Suprarenal calcification is usually due to tuberculosis, rarely to Addison's disease. Small, semilunar opacities are found at the side of the spine above the kidney region.

Calcification of the ureter resembles that of the veins, but has no specific characters.

In the bladder, the mucosa may present calcifications in cases of tuberculosis, abscess, or toxic necrosis. Among the parasites, schistosoma hematobium is most frequently calcified and found especially at the trigonum and ureteral orifices; the wall of the bladder infiltrated by calcified eggs may give a dense, massive shadow. Calculi are differentiated from bilharziasis by their form and distinct contours. Pyelography and cystography are indicated.

In men, calcifications may be found in the prostate, seminal vesicles, and deferent ducts. Prostatic calculi are rare; they are usually multiple, round, and bilateral on the median line about 2 or 3 cm. above the symphysis.

In women, calcification may occur in the ovaries (dermoid cysts must be remembered), the tubes (especially in pyosalpinx), and the uterus (retention cysts, granulomatous tissues, and tumors). The only calcifications demonstrable by roentgen examination are those of fibromyomas.

RICHARD KEMEL, M.D.

Bell, J. C.: Some Uses of the Spot Film in the Roentgen-Ray Examination of the Gastro-Intestinal Tract. *Radiology*, 1940, 34: 469.

Bell states that the spot film supplements but does not replace films made in the usual manner. When spot films are indicated by the fluoroscopic findings, he routinely makes a film in the right postero-anterior oblique position, with the patient supine and rotated toward the left; this is of value in showing the fundus of the stomach filled with opaque material, and usually gives an excellent double contrast view of the mucosa of the distal two-thirds of the stomach and the duodenal cap. A second film is made in the left postero-anterior oblique or direct lateral position with the patient horizontal; this is helpful in determining which wall of the duodenum is involved when ulceration is present. In most cases, serial films, usually eight in number are then made in the right postero-anterior oblique position with the patient prone; these usually show the distal two-thirds of the stomach and the duodenum but may be taken to show other portions of the gastro-intestinal tract. In addition, many other films may be made with the patient either upright or horizontal, when indicated by the fluoroscopic findings.

Of the lesions commonly found in the esophagus, only the diverticulum and the ulcer can be demonstrated to advantage by this type of film. The mucosal relief of the stomach may be well shown, posterior-wall ulcers away from the curvature may be demonstrated, and the mucosa about the base of an ulcer may be visualized. Early carcinomas, polyps, and small benign tumors may be demon-

strated. The author states that the spot film has proved to be of greatest value in demonstrating the niche in duodenal ulcers; when shown, it is regarded as positive proof of ulceration, past or present. He considers the spot film excellent for recording duodenal diverticula, benign tumors of the duodenum, and other lesions in this area. Also, he believes it ideal for demonstrating a marginal ulcer in the stoma of a gastrojejunostomy or a jejunal ulcer. Many lesions of the small intestine and colon may be shown to advantage by the spot film.

It is Bell's opinion that the spot film should become an important adjunct to the film technique in many roentgen-ray examinations of the gastrointestinal tract and gall bladder.

EARL GARSIDE, M.D.

Bignami, C.: Reactions and Local and General Changes Caused by Roentgen Therapy With 350 Kilovolts (Reazioni ed alterazioni locali e generali da roentgenterapia a 350 kv.). *Radiol. med.*, 1940, 27: 271.

Bignami made a comparative study of the reactions and the local and general changes observed in roentgen treatment with 170 and 350 kv., respectively. He used 57 patients with carcinoma of the portio, who all were in about the same condition at the time the treatment was started; the age of the patients varied between forty and sixty years. Each patient was first given a radium treatment with from 40 to 50 mgm. of radium in tubes of from 5 to 10 mgm., filtered with 1 or 2 mm. of platinum and introduced into the cervical canal and the vaginal fornices. A total dose of from 55 to 60 destroyed millicuries was given in from seven to nine days. One and one-half months later, the roentgen treatment of the pelvis was instituted through two portals, a hypogastric and a sacral one. Each portal received 3,000 roentgens in fractions of 150 roentgens per day. Two sittings were used each day so as to give the total dose of 6,000 roentgens in twenty days.

Comparison of the results obtained in the patients treated with 350 kv. and with 170 kv., respectively, showed:

1. The cutaneous lesions caused by gamma roentgen therapy were always of lesser importance and duration when the same doses were used: nearly complete repair occurred within three months and return to normal, at least from the esthetic point of view, within six to twelve months.

2. The behavior of the intestinal disturbances and of the radiation disease was practically the same for the two methods.

3. Gamma roentgen therapy exerted a more damaging action on the weight of the body and, to a minimal degree, on the arterial tension: the decrease in weight was greater and lasted longer and its final recovery was slower.

To these results must be added those of the author's previous investigations on the changes of the blood, in which it was shown that gamma roentgen therapy causes less increase in the coagulation time, less decrease in the globular resistance, and similar or even less serious changes in the blood picture than those observed after treatment with 170 kv. Therefore, it is advisable to give the preference to gamma roentgen therapy for the treatment of numerous disorders, especially if they are deeply located and consequently require the use of very high doses.

RICHARD KEMEL, M.D.

Porta, R.: The Results of Roentgen Therapy in Malignant Lymphogranulomatosis (Risultati radioterapeutici nella linfogranulomatosi maligni) *Minerva med.*, 1940, 31: 169.

The author reports on 70 cases of malignant lymphogranulomatosis treated and followed up in the period from 1927 to 1937. In practically all the cases diagnosis was confirmed by biopsy. The cases were classified as follows: (1) glandular forms—1 peripheral localization, (8); multiregional peripheral localization—cervico-axillo-inguinal—(22); abdominal (5); mediastinal (6); combined mediastinal and peripheral (14); (2) extra-lymph-gland forms—splenic (1); hepato-splenic (6); and (3) generalized lymphatic form with visceral localization (8). These distinctions were made on the clinical manifestations when the patient first reported. However, later in the course the reticulo-endothelium everywhere became involved, with particular emphasis on the lymph glands. The more rare localizations are grouped as follows: (1) osteoperiosteal (4); (2) pleuropulmonary (6); (3) cutaneous (7); (4) nervous (3). The most common localization was the peripheral glandular whether single or multiregional, and this group was most readily diagnosed. The most difficult to diagnose was the mediastinal type; only 6 of 19 such cases were diagnosed early, before the invasion of the peripheral glands and other organs. X-ray examination is most valuable in mediastinal cases. Some of these cases may be confused with dilated aorta. The author discusses in some detail the clinical manifestations of the rarer types of localization in the bones, abdomen, lungs, nervous system, and skin.

Hematological examination in these cases indicated a leucocytosis from 10,000 to 20,000, with at times an eosinophilia and a moderate monocytosis. In the early stages there was no reduction of the erythrocytes or hemoglobin.

As to the clinical course the author found three types; (1) acute course of typhoid form (1); (2) subacute course (59); and (3) chronic course (10).

Radiotherapy is the method of choice in treating malignant lymphogranuloma and the x-rays are the only medium which exerts a favorable effect on the course of the disease. The action of the x-rays is direct and rapid on the granulomatous tissues, which become sclerotic, and the lymphoid structures are destroyed and replaced by connective tissue. Early cases in the stage of lymphoid hyperplasia are most sensitive to the influence of the x-rays. This indicates the necessity of early roentgen therapy.

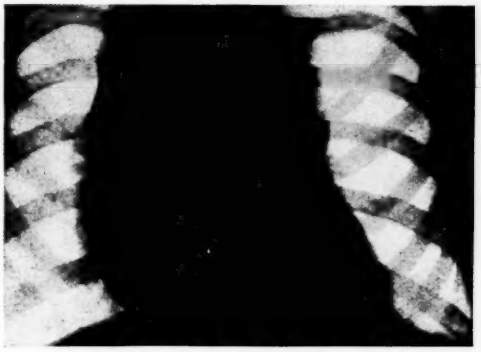

Fig. 1. Mediastinum at beginning of treatment.

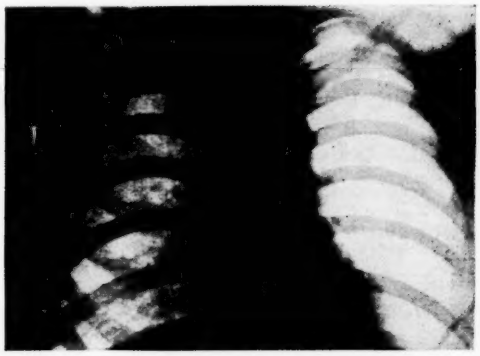

Fig. 2. Same patient as in Figure 1 after two courses of radiation therapy. Patient lived four and one-half years after the beginning of treatment.

Within seven or ten days after roentgen therapy the masses of granulomatous tissue begin to shrink. With improvement of the local condition there is also a general improvement of the patient. Fever drops, mediastinal-pressure symptoms disappear, the blood improves, and one gets the impression that the morbid process is cured. However, the x-rays only induce a remission in the progress of the ailment. The duration of life depends on individual variations and factors such as the clinical type, the stage of the disease in which roentgen therapy was begun, and the special localizations of the morbid process. The acute forms are not susceptible to roentgen therapy and are even aggravated by the latter. The course is usually from three to six months. The author's only patient with an acute condition died after a course of four months and the author was under the impression that the roentgen therapy aggravated the condition. In subacute types the patients have survived from two to three years. In the chronic type they have survived from four to six years. As to localization, the most serious as to the duration of life are the pulmonary and the hepatic types. X-rays prolong the life of these patients (see Figs. 1 and 2).

As to the technique of roentgen therapy, the author exposes each focus to from 500 to 600 roentgens fractionated according to the sensibility of the patient. For mediastinal irradiation he uses two large fields anteriorly and posteriorly (15 by 15 or 20 by 20). In mediastinal cases small doses which are gradually increased are advised in order to avoid severe reaction. The author uses 160 kv., filters of copper (0.5) plus aluminum (1.0) at a distance of from 30 to 50 cm. JACOB E. KLEIN, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Maggi, N.: A Contribution to the Knowledge of Spontaneous Juvenile Gangrene. Attempts at Treatment with the Female Sexual Hormones (Contributi alla conoscenza della gangrena spontanea giovanile. Tentativi di trattamento con gli ormoni sessuali femminili). *Arch. ital. di chir.*, 1939, 57: 421.

Maggi presents some arguments in favor of the suprarenal theory of the pathogenesis of spontaneous juvenile gangrene and shows that some of the objections raised recently against this theory cannot be accepted. He insists on the importance of the constitutional endocrine factors in the determination of the disorder and especially on the congenital miopragia of the vascular system. The results of his previous studies and those obtained by other authors led him to treat with injections of folliculin 9 patients suffering from spontaneous juvenile gangrene. He used commercial preparations, especially progynon B in ampoules of 1 c.cm. containing 10,000 I. U. and ovocyclin in ampoules of 1 c.cm. containing 10,000 and 20,000 I. U. of folliculin; in isolated cases, he injected estrolase which contains only 250 I. U. of folliculin per cubic centimeter. During the entire period of observation, he has not seen any serious incidents. In 1 case, the administration of a rather high dose (20,000 units) caused a sudden activity of the breasts and temporary aggravation of pain, which disappeared promptly on suspension of the treatment and did not return when smaller doses were used subsequently. In another case that had been greatly improved with average (10,000 I. U.) and small (250 I. U.) doses, the administration of higher doses caused, for some unknown reason, a sudden aggravation of the process which required immediate amputation; this patient had been ill for seven years and had been admitted with a condition of the foot which indicated prompt amputation, but had been improved so much by the folliculin treatment that the amputation could be deferred for several months. No decrease in libido and no involution of the testicles was noted in the patients.

In general, the subjective symptoms and the objective course of the disease were decidedly improved and the process has not recurred up to the present time. There was marked remission of the pains usually after from 4 to 6 injections; they gradually decreased in intensity and frequency, and the cramps in the calves disappeared last. Frequently, the patients reported the appearance of perspiration a few hours after and even before the injection, associated with an agreeable feeling of warmth over the entire body and especially in the involved parts. The ulcerations which had been present for a long time and had resisted all treatment were healed in from one and one-half to two months.

The oscillometric index was studied in the four extremities and in the two parts of each extremity in all patients. In general, there was an increase in the index accompanied usually by a decrease of the pressure values in those extremities which were most strongly involved by the process, generally the lower ones and particularly the legs. On the other hand, the index remained unchanged or was decreased in the proximal parts of the extremities and especially in the arms. It would seem that, in the presence of a vasodilating action of the female sexual hormones, the behavior of the anatomically healthy arterial segments which are more or less contracted differs from that of the segments in which the importance of the spasm has been reduced to second place by the presence of anatomical lesions; when the vessel is intact, vasodilatation induces, with a slight fall of the pressure, a slighter impulse of the blood wave on the vascular wall and therefore a decrease in the oscillographic values; when the vessel is strongly altered, the suppression of the spasm allows full play to the minimum of permeability which the vessel still possesses and permits the blood wave to transmit the impulse to the vascular wall, even if only weakly. However, it should not be thought that completely obliterated vessels, in which the oscillometric index is zero, can still be influenced by the treatment and can be recanalized. Improvement in these cases must be attributed to the vasodilating action of the hormones on collateral vessels which are still in good anatomical condition; this fact is proved by the absence of changes in the oscillometric index.

RICHARD KEMEL, M.D.

Sheehan, H. L.: The Pathology of Acute Yellow Atrophy and Delayed Chloroform Poisoning. *J. Obst. & Gynaec. Brit. Emp.*, 1940, 47: 49.

True acute yellow atrophy is very rare in pregnancy. Among Bergstrand's 72 cases there was none in a pregnant patient, and in the last 400 post-mortem examinations on pregnant or puerperal women in the Glasgow Royal Maternity Hospital there has not been a single example. It would appear that true yellow atrophy of the liver is so uncommon in pregnancy that it can be looked upon only as a chance complication.

Obstetrical acute yellow atrophy appears to be a definite entity. Clinically, it is very similar to true acute yellow atrophy, but the pathology is sufficiently distinctive to make differentiation of the two diseases easy. Sheehan's description is based on 6 cases found in the last 400 obstetrical post-mortem examinations.

At autopsy the patient is deeply jaundiced. The liver is yellow and rather small. Its lobular pattern is not lost. Microscopically all the cases showed an identical lesion; there was a gross fatty change effecting the entire lobule except a sharply defined rim of

normal cells around the portal tracts. The affected cells were bloated by a fine foam of tiny fatty vacuoles throughout the cytoplasm. The nuclei were normal, and there was an entire absence of necrobiotic change. The liver lesion does not show any histological similarity to true acute yellow atrophy; there is an entire absence of necrosis in the obstetrical cases.

The cause of the disease is not known. Clinically, the condition has to be differentiated from true acute yellow atrophy; toxic necroses of the liver by chloroform, atophan, salvarsan, or phosphorus; catarrhal jaundice; and cholelithiasis.

Delayed chloroform poisoning appears to be much more common in obstetrical than in other types of patients. Fourteen cases were found in the last 400 post-mortem examinations. Pathologically, they may be divided into three groups, each with a fairly constant clinical basis.

In the isolated-cell lesion group, the result appeared to be due to an overdose of chloroform in a healthy subject. Microscopically there was a lesion with a peculiar affinity for certain individual cells in the liver columns, leaving quite untouched other cells between the damaged ones. The affected cells were about twice the normal diameter and ballooned to a spherical shape; they had a clear non-fatty cytoplasm and a tiny pyknotic nucleus. The 2 patients in this group died of conditions unrelated to the anesthetic, and neither had any evidence of hepatic insufficiency; if they had recovered, the lesion could presumably have been repaired by regeneration within a few days.

The mid-zonal necrosis group is the most common type of lesion in obstetrics and 9 examples were seen in this study. All of the patients had a prolonged labor before administration of the chloroform. Microscopically, the essential lesion was a mid-zonal necrosis which was quite universal but varied in severity from place to place. Four of the patients had endometrial sepsis, and 2 of these had also an early general peritonitis. There is no evidence that the sepsis played any part in the production of the liver lesions.

Two cases of the central-necrosis group were seen. Each of the patients had hyperemesis, had aborted under chloroform without the preliminary intravenous administration of glucose, and died three or four days later. Microscopically, the central zone and the inner part of the midzone of the liver were completely necrosed, the outer half of the midzone showed a definite fatty change but appeared viable, and the periportal zone was intact.

Delayed chloroform poisoning is almost entirely confined to patients who have a gross metabolic disturbance before the administration of the anesthetic. The factor of a starvation acidosis appears to be common to all cases. It is to be emphasized that the patient who has been left in labor for a few days without adequate treatment is extremely susceptible to what may be regarded rather as a poisoning by delayed chloroform than as a delayed poisoning by chloroform. Repetition of chloroform anesthesia after an interval of a day or two may lead to damage if the patient has been allowed to develop acidosis after the first anesthesia. CHARLES BARON, M.D.

Leriche, R., and Jung, A.: What is a Callus? (Qu'est-ce qu'un cal?). *J. de chir.*, 1940, 55: 193.

Leriche and Jung note that new bone formation of the same type as that found in callus occurs in forms of injury involving tissues near a bone without injury to the bone itself. In luxation or sprain without fracture there is formation of new bone in the muscles or ligaments at the site of the injury. The new bone formation that has been given the name of callus does not result from fracture *per se*, but from trauma; it is but one form of post-traumatic osteogenesis. In fracture, there is typically a decalcification of the injured bone which may extend much beyond the limit of the injury and may become widely generalized; this decalcification supplies the mineral elements for the formation of the callus. However, similar decalcification, sometimes generalized, may occur after a simple sprain or luxation. The new bone formation that has been called callus in fracture does in many cases take part in the healing of the fracture and the reparation of the bone, it is true; but, on the other hand, there may be new bone formation of a similar type around the fragments in ununited fractures. Such new bone formation and the new bone formation in luxations and sprains which play no part in reparative processes do not differ in their essential characteristics from the new bone formation that aids in the repair of fracture. They are all due to various modifications in the connective tissue produced by post-traumatic vasomotor disturbances. So-called callus is not primarily a reparative process, it is a pathological process of the same type as para-articular ossification in sprains and muscular osteoma in luxations. This new bone formation and the accompanying decalcification in fracture may be considered as a "biological disease" of fracture.

ALICE M. MEYERS.

Borghetti, U.: The Relation between Epulis, Myeloma, and Osteodystrophy (Sui rapporti tra epulidi, tumori a mieloplassi e osteodistrofie). *Tumori*, 1940, 26: 1.

The author agrees with Morpurgo that there are many neoplasms which are difficult to classify oncologically. Among these are cheloids, desmoids, dermatofibromas, epulis, and giant-cell tumors. A brief discussion of these difficulties is presented.

The author refers to epulis as the classical giant-cell type of tumor. He then reviews some of the hypotheses regarding its origin. Barbacci and others believe that epulis is of true blastomatous nature. Hellner and others have tried to associate the giant-cell epulis with the form of bone dystrophy localized to the maxilla. Recklinghausen was the first to identify the giant-cell epulis with the brown tumors of osteitis fibrosa. Arlotta reported a case of multiple

epulis in which it was determined that the growths were external manifestations of the osteitis fibrosa involving the mandible. The author is of the opinion that giant-cell tumors of the skeleton have the same essential characteristic as the epulis, i.e., the contrast between histological signs of malignancy and a benign clinical course. Whereas some authors make a distinction between the more common type of benign giant-cell tumor and the exceptional malignant form, others consider giant-cell tumors as true blastomas and do not distinguish a benign and a malignant variety, with the possibility of the former developing into the latter.

The author then reports a case of epulis and multiple myeloma developing during pregnancy in a thirty-eight-year-old female. The patient first noticed in her sixth month of pregnancy a small tumor arising on the gum between the right lower second premolar and first molar teeth. It was associated with no pain but gradually increased in size to that of a hazel-nut. Under local novocaine analgesia the two teeth bordering the tumor were extracted and the tumor was excised with the cautery. Histological examination revealed typical giant cells characteristic of epulis. The patient was then treated with radium and discharged as cured. Sixteen months later she returned complaining of two tumor masses over the crest of the right tibia, which she first noticed several days after her discharge from the clinic and which had gradually increased in size. Aspiration biopsy was done and histological examination revealed characteristic giant cells similar to those present in the epulis. This was subsequently verified by surgically removed sections of the tumor. Roentgenological studies of the skeleton revealed multiple circumscribed areas of bony rarefaction in both tibias and ulnas, the right acromion, left ilium, left twelfth rib, and cranium. The histological and roentgenological appearance is illustrated.

The author then discusses the difficulties of classifying this case and concludes that it is an example of the possible transformation of the localized form of giant-cell tumors (epulis, solitary giant-cell tumors) into the generalized type.

MICHAEL DEBAKEY, M.D.

Prates, M.: A Study on Carcinomas Deriving from the Skin (Contribuição para o estudo dos carcinomas derivados da parede de quistos epidermóides). *Arq. de patol.*, 1939, 11: 433.

The exact origin of neoplasms of the skin is not always clear as the tumors may arise from the epithelium, sudoriferous glands, sebaceous glands, or dermoid or epidermoid cysts.

In 2 instances the author was able to demonstrate the origin of a cancer of the skin from epidermoid cysts. Although only a few similar cases have been published, this type of carcinoma does not appear to be rare. The occurrence of this particular type of cancer is an example of the grave consequences which may follow a neglectful treatment of the original condition, or no treatment at all.

One of the cancers observed by the author was located on the upper lip and the other in the temporal region. Only an extirpation of the tumor during the early stages of the condition allows a demonstration of its exact origin.

According to the author's opinion a malignant degeneration is due in the majority of cases to prolonged irritation of a malformation. A cancer of this type may also develop from a fistula originating in the remaining portion of the cyst after an incomplete excision. In the 2 cases mentioned probably the first mode of origin prevailed.

JOSEPH K. NARAT, M.D.

Gilchrist, R. K.: Fundamental Factors Governing the Lymphatic Spread of Carcinoma. *Ann. Surg.*, 1940, 111: 630.

A very careful study of the lymph-node metastases in 74 operative specimens of carcinoma of the rectum and colon was made. Full-scale drawings of cleared specimens were made, with the arterial tree and the exact location of the lymph nodes in relation to the tumor and arteries. Three hundred and sixty-four of these nodes contained carcinoma metastases. In addition, 651 microscopic sections of lymph nodes were studied in a similar fashion in operative specimens of carcinoma of the breast. There were 118 of these nodes which contained metastases.

Study of this surgical material brought out the following facts:

1. Permeation of carcinoma through lymph channels was seen only when the lymph node central to the channel involved was already blocked with carcinoma.

2. Carcinoma metastases do not completely destroy the function of a node until all of the node is destroyed. This was shown in a surgical specimen of carcinoma of the breast. The lymph channels in the neighborhood of the tumor were injected with a suspension of carbon particles. The specimen was cleared and some of the lymph channels and several lymph nodes were seen to be outlined in black. This section showed how the suspension could still flow into a node which contained a large metastasis. Most of the carbon was found in the normal part of the node although some of it penetrated a short distance along spaces between the cancer cells.

3. Forty-four of the 364 carcinomatous nodes contained metastases limited to the subcapsular space just beneath the capsule. In 150 of the 364 involved nodes, the lymphoid tissue was completely replaced by carcinoma.

4. Throughout the entire series a common pattern of lymph-node metastasis was seen. When the metastasis had grown larger than the small subcapsular lesion, the spread was by expansion around the subcapsular space and into the depth of the node. This was usually accompanied by a thickening of the capsule especially over the area adjacent to the growth. There was sometimes a more or less heavy layer of fibrous tissue between the cancer cells and the lymph cells. In many cases there was so much

interference with nutrition that a thick layer of fibrous tissue was seen; a thin rim of live cancer cells was within this, and necrosis was in the center. Growth progressed until one or several large nodes were seen; these usually lay close to the main blood vessels, in which the lymphoid tissue was completely replaced by carcinoma. Groups of lymph nodes which were completely replaced by metastases were found in certain regions. In specimens of carcinoma of the rectum and lower sigmoid such nodes were usually located near the bifurcation of the superior hemorrhoidal artery (Fig. 1). In carcinoma of the breast, nodes about 1 in. below the brachial vein and along the lateral edge or just behind the pectoralis minor muscle were the ones most likely to be completely replaced by carcinoma. The group of heavily involved nodes was along the main or primary line of lymph drainage. Nodes involved below or lateral to these nodes were apt to be subcapsular lesions or lesions which were obviously late metastases.

5. In no case had there been any evidence of penetration of carcinoma outside of the capsule of any node, except where there was a collection of large involved nodes lying tightly packed together. In 7 of the 9 cases in which this occurred, the superior hemorrhoidal artery or the main artery supplying the region of the nodes was blocked by pressure of the nodes. Several of these nodes contained necrotic material.

6. In 6 cases, retrograde metastasis of the lymph nodes was found below carcinomas of the bowel or rectum. In every one of these enough of the nodes central to the lesion were completely replaced by carcinoma to suggest definitely that there was a very marked obstruction to the lymph flow and the metastasis occurred by retrograde means.

7. Post-mortem examination of surgical patients demonstrated the tendency of the lymph nodes to block the spread of carcinoma even in advanced cases. Figures 2 and 3 illustrate that in spite of the extensive lymph-node metastases in the operative specimen, there were no metastases above the point of resection. The one node involved was about 1 cm. lateral to the widest point of resection, along the superior surface of the levator-ani muscle.

Experiments in which a suspension of insoluble particles was injected into afferent lymph channels of the mesentery of dogs and rabbits were also performed. It was found that the normal lymph node of a rabbit or dog would not pass a suspension of insoluble particles 1μ or less in diameter even when pressure of 120 cm. of water was used. The coloring of a number of adjacent nodes by the particles following the injection into a single afferent lymph channel was explained by the anatomical distribution of the collateral or retrograde lymph channels. The blockage of the afferent channels of one node with sodium morrhuate three or four days before the injection of the suspension produced dilatation of the collateral channels. It was shown that when a node was destroyed or blocked, the lymph drainage was re-routed through collateral channels, or by retrograde means, into a channel draining into a normal node.

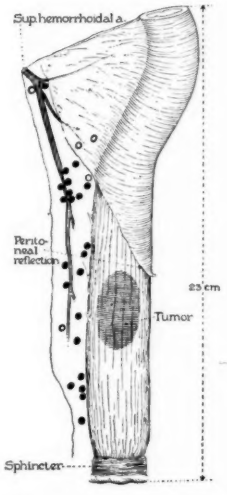

Fig. 1. Operative specimen showing almost complete occlusion of superior hemorrhoidal artery by a mass of necrotic carcinomatous nodes. In some of the tightly packed nodes the carcinoma had penetrated through the capsule.

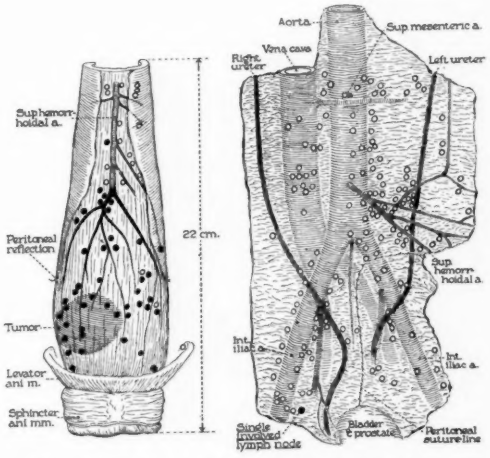

Fig. 2. Operative specimen of carcinoma of the rectum showing extensive lymph node metastases above the tumor, and diagram of the autopsy preparation showing limitation of the upward metastasis.

Fig. 3. The one node involved was just outside of the operative field—and it was a small subcapsular lesion.

(Courtesy of J. B. Lippincott Co.)

Carcinoma cells are 7μ or more in diameter, in contrast to the particles used in the experiments, which were all less than 1μ in diameter. The normal system of collateral lymph channels, plus the demonstration of retrograde channels available when the nodes were blocked, showed how much more likely spread of the large carcinoma cells was apt to be by collateral channels than by growth through the lymph nodes.

All these facts led to the conclusion that the lymphatic spread of carcinoma was primarily embolic. The nodes in which the emboli lodged prevented further spread until the node was completely overwhelmed by carcinoma. Further embolic spread was through the collateral channels, each new node involved tending to make a longer and more difficult channel for a new embolus to travel. Spread from one node to another did not seem to be common, at least during the period when the lesions were operable. Thus the finding of a group of involved nodes within the field removable by surgery does not mean that such a case is hopeless, although the chance of complete removal is much less than in the cases in which such nodes are not found.

SAMUEL H. KLEIN, M.D.

DUCTLESS GLANDS

Celestino da Costa, A.: The Paraganglia and the Sympathetic System (Paraganglions et sympathique). *Ann. d'endocrinol.*, 1939–40, 1: 337.

After a short historical review the author discusses the anatomy, histology, and embryology of the paraganglia. While, for the most part, the subject matter is treated as in a critical review, the author has added several original observations particularly in relationship to the origin of paraganglia.

According to the author the three most important developments in the knowledge of the paraganglia were their origin from cells that immigrated from the spinal cord, their affinity for potassium bichromate (the reaction of Henle), and their resemblance to the suprarenal medulla. The anatomical distribution of the paraganglia in man and in the lower animals is described in great detail. The formations of sympathetic origin are considered first. In attempting to correlate the structures in which there is no evidence of a sympathetic connection the author describes the classification of Kohn who distinguishes three varieties: (1) chromaffin paraganglia, dependent upon the sympathetics, as the suprarenal medulla, the suprarenal bodies of the selachians, and the organ of Zuckerkandl; (2) the non-chromaffin paraganglia dependent upon the vagus; and (3) mixed paraganglia to which may be traced sympathetic and parasympathetic nerves such as the glossopharyngeal and the vagus in the carotid body. Various histological methods are discussed and an effort is made to explain the results of these methods on a histochemical basis.

The author discusses in a critical way the embryological proof that has been advanced to explain the nature of these structures. His own observations are beautifully illustrated and are of great interest.

NATHAN A. WOMACK, M.D.

EXPERIMENTAL SURGERY

Witschi, E., and Riley, G. M.: Quantitative Studies on the Hormones of Human Pituitaries. *Endocrinology*, 1940, 26: 565.

In this study, the hypophyses of more than 100 human beings were dried with acetone and their gonadotropic, thyrotropic, lactogenic, and chromatophorotropic hormones were measured by biological assays on various test animals. For the main part, immature female rats were used, but sparrows, pigeons, and Weaver finches were also used.

No distinct variations according to age and sex were found with respect to the thyrotropic, the lactogenic, and chromatophorotropic hormones. There was an appreciable difference in the quantity of the gonadotropic hormones in the different ages and sexes and at different periods in the life cycles. It is very small in children, while old women (more than fifty years old) and castrated women have very high values. In the productive age the hypophyses of men are about four times as potent as those of women of the same period. During pregnancy, the gland rapidly loses potency, regaining it toward the end and more rapidly after delivery. The human gonadotropic hormone is unusually rich in the follicle-stimulating fraction, while the luteinizing hormone is present only in traces.

JOHN WILTSIE EPTON, M.D.

Korenchevsky, V., and Hall, K.: Pathological Changes in the Sex Organs After the Prolonged Administration of Sex Hormones to Female Rats. *J. Path. & Bacteriol.*, 1940, 50: 295.

Experiments were performed on 181 normal rats or castrated female rats, pathological changes being produced in the uterus, vagina, and ovaries with various male and female hormones, injected alone or in various combinations for prolonged periods of from fifty-three to one hundred forty-six days.

Lengthening the period of injection of estrogens resulted in a greater size and weight of the uterus and vagina in castrated rats, and in a gigantic size of these organs in normal rats; and the pathological changes in the sex organs were also increased.

The most important of these changes in the uterus were metaplasia and desquamation of the epithelium, and an increase in fibrous tissue in the mucosa of all the rats. Subepithelial edema and epithelial or subepithelial cysts appeared in the castrated rats. Glandular cysts and irregular development and edema of the circular muscle layer occurred in normal rats.

In all of the normal rats the vaginal epithelium was mucified to various degrees, sometimes as much as during pregnancy. In the castrated rats, mucification did not appear until three or four months after the last injection of estradiol benzoate-butyrate.

In most of the rats the ovaries were enlarged or of normal size and weight, with enlarged or normal corpora lutea; in 1 rat the ovaries were very small, with few and mostly small corpora lutea. While the corpora lutea appeared to be of normal structure, the follicles were of small or of medium size and the majority of them were atretic or degenerated. The cells of the interstitial tissue were vacuolated.

Lengthening the period of injection of androsterone into castrated rats was followed by better development of the vagina but not of the uterus. The administration of androsterone in addition to estradiol caused a co-operative stimulating effect on the uterus and vagina of both castrated rats and normal ones, producing in the latter gigantism of these organs. When both hormones were injected, the vaginal epithelium of normal rats became mucified or swollen, while dropsical vacuolation usually appeared in the castrated rats. The ovaries were either large or atrophic and contained large or atrophic corpora lutea.

Lengthening the period of the injections did not strengthen the effect of dehydro-androsterone on the sex organs of castrated rats. When estradiol and dehydro-androsterone were injected simultaneously, the effect of the estradiol predominated, with disappearance of the mucification of the vaginal epithelium, which appeared after the injection of, and was typical for, dehydro-androsterone alone.

Compared with experiments of shorter duration, lengthening the period of administration of testosterone esters into ovariectomized rats was followed by the development of a larger uterus and vagina, but a similar pathological structure. After simultaneous injections of testosterone and estradiol esters, a still greater development of these organs was obtained, but additional and sometimes very pronounced pathological changes appeared in the uterine mucosa—cystic hyperplasia of the glands ("Swiss cheese" mucosa), with adenomatous growth in some cases, and more or less general squamous metaplasia of the uterine epithelium. The myometrium, however, after injections of the two hormones, was better developed and of a more normal structure than it appeared to be after the injection of either of these compounds alone.

While in such cases the changes in weight and size of the sex organs, and the development of the myometrium were comparatively constant co-operative effects, any of the changes in the mucosa could appear in different rats alone, or in some or all simultaneously; thus a resistance or predisposition of individual animals to these substances was demonstrated.

The addition of progesterone to male and estrogenic hormones was followed by the development of a smaller uterus and, because of the larger doses of estradiol used, there was an absence of pronounced progestational changes in the mucosa.

In the experiments of longer duration, testosterone propionate injected alone, in small doses, into normal adult rats caused a decrease in the size and weight of the uterus, while in large doses it produced a gigantic uterus, abnormally distended with fluid which was either clear or contained leucocytes. The vagina was greatly hypertrophied following both large and small doses, while in the ovaries the development of corpora lutea and follicles was arrested.

In the experiments of shorter duration (twenty-one days), on the contrary, a gonadotropic (chiefly luteinizing) effect of testosterone propionate on the ovaries was observed.

Simultaneous injections of testosterone and estradiol esters were followed by the development of a gigantic uterus and vagina, the former having a pathological structure with glandular cysts. In the ovaries the follicular development was depressed, luteinization was decreased or absent, and the formation of follicular cysts of different sizes, in some cases very large, was a prominent pathological change.

The results obtained by different workers indicate the possible harmful effects of testosterone propionate on the uterus and ovaries. This must be taken into consideration in the therapeutic administration of this hormone to women.

Progesterone not only appears to lack a pathological action on the female organism, but, in rats, if given in suitable doses, it can prevent severe metaplasia of the uterine epithelium, and perhaps also some other pathological changes, such as adenomas and cysts. Since metaplasia of the uterine epithelium may be considered as the first stage of the precancerous changes produced by estrogens, the disturbance of the ratio of male and female sex hormones may, perhaps, play a part in the development of some human tumors, for treatment of which the effect of progesterone should be investigated.

SAMUEL KAHN, M.D.

Mellish, C. H., Baer, A. J., and Macias, A. C.: Experiments on the Biological Properties of Stilbestrol and Stilbestryl Dipropionate. *Endocrinology*, 1940, 26: 273.

Stilbene derivatives have a rather extensive use in Europe. In the United States they are being used in clinical investigations, and until their clinical safety and therapeutic value have been established, they will not be released for general clinical use.

Since the initial report of Dodds, Goldberg, Lawson, and Robinson on the preparation and estrogenic properties of stilbestrol, a number of workers have further compared the actions of this compound and of its propionic and acetic-acid esters with those of estrogens with a nucleus of the phenanthrene type. In the majority of experiments thus far published, the two classes of compounds have been found to be qualitatively similar in their action.

The present communication represents a study concerned with the action of stilbestrol and stilbestryl dipropionate upon (a) body growth, the reproductive system, and the pituitary and adrenal glands of immature rats, and (b) the immature rabbit uterus, with especial regard to the ability of the stilbene derivatives to sensitize it to progesterone.

Seventeen rabbits and 317 rats were used in these experiments.

Dodds, Lawson, and Noble, and de Fremery and Geerling found that stilbestrol induced growth of the immature rabbit uterus and sensitized it to progesterone. In these experiments, using the McPhail technique, stilbestryl dipropionate was at least as effective as an equal weight of estrone in producing growth and development of the immature rabbit uterus and in sensitizing it to progesterone.

Neither stilbene derivative exhibited progestin-like action when administered to immature female rabbits in doses of 1 and 4 mgm., respectively, over a period of ten days.

Subcutaneous implants of 10 mgm. of stilbestrol and stilbestryl dipropionate were made in thirty-day-old rats. The animals were killed at 56, 57, and 58 days of age and autopsy studies were made. Stilbestrol inhibited body growth in animals of both sexes. In males the dipropionate caused a more effective inhibition of body growth and a more prolonged action than stilbestrol. Stilbestrol inhibited the growth of the gonads of both sexes as well as of the seminal vesicles and prostate. Stilbestryl dipropionate caused a greater suppression of the testes and prostate than stilbestrol, but it inhibited the seminal vesicles to a lesser degree. Treatment with the stilbene derivatives increased the weight of the pituitary gland, but did not cause a significant change in the weight of the adrenal glands.

Chorionic gonadotropin increased the ovarian weight of rats previously treated with stilbestrol. The weight increment was equal to that produced by human pregnancy urine in untreated animals of the same age, but less than that resulting from its administration to immature animals.

Noble reported that the subcutaneous implantation of stilbestrol inhibited body growth and development of the genitalia of male and female rats through suppression of the anterior pituitary lobe hormone. However, he found that the administration of chorionic gonadotropin stimulated the ovaries of stilbestrol-treated rats more than it did those of untreated controls. In these experiments, chorionic gonadotropin increased the ovarian weight of rats previously treated with stilbestrol. The weight increment was equal to that produced by human pregnancy urine in untreated animals of the same age, but less than that resulting from its administration to immature animals. JOHN E. KIRKPATRICK, M.D.